Gorst Creek -
Bremerton Auto Wrecking Landfill
Integrated Assessment Report
Port Orchard, Washington
TDD: 03-07-0009

Contract: 68-S0-01-01
June 2004

Region 10

START-2

Superfund Technical Assessment and Response Team

Submitted To: Joanne LaBaw, Task Monitor
United States Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101

GORST CREEK - BREMERTON AUTO WRECKING LANDFILL
INTEGRATED ASSESSMENT REPORT
PORT ORCHARD, WASHINGTON

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LIST OF ACRONYMS

Acronym	Definition
%R	percent recovery
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
AWQC	Ambient Water Quality Criteria
bgs	below ground surface
CCC	Ambient Water Quality Criteria chronic effect
CLP	Contract Laboratory Program
CLPAS	Contract Laboratory Program Analytical Services
CMC	Ambient Water Quality Criteria acute effect
COCs	contaminants of concern
CRDL	Contract Required Detection Limit
CRQL	Contract Required Quantitation Limit
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DQOs	data quality objectives
EPA	United States Environmental Protection Agency
GPS	Global Positioning System
IA	integrated assessment
IDW	investigation-derived waste
MCLs	maximum contaminant levels
mg/kg	milligrams per kilogram
MS/MSD	matrix spike/matrix spike duplicate
MS/DUP	matrix spike/duplicate
MSQS	Marine Sediment Quality Standards
MTCA	Model Toxics Control Act
NOAA	National Oceanic and Atmospheric Administration
PCBs	polychlorinated biphenyls
PELs	probable effect levels
pesticides	chlorinated pesticides
PPEs	probable points of entry

GORST CREEK - BREMERTON AUTO WRECKING LANDFILL
INTEGRATED ASSESSMENT REPORT
PORT ORCHARD, WASHINGTON

1. INTRODUCTION

The United States Environmental Protection Agency (EPA) has tasked Ecology and Environment, Inc., to provide technical support and conduct an integrated assessment (IA) at the Gorst Creek - Bremerton Auto Wrecking Landfill site located in Port Orchard, Washington. E & E completed the IA activities under Technical Direction Document Number 03-07-0009 issued under EPA, Region 10, Superfund Technical Assessment and Response Team (START)-2 Contract Number 68-S0-01-01. The four goals for this IA are presented below:

- Collect and analyze samples to characterize the potential sources discussed in subsection 2.6;
- Determine off-site migration of contaminants;
- Provide the EPA with adequate information to determine whether the site is eligible for placement on the National Priorities List; and
- Collect sufficient data to document any threat or potential threat to public health or the environment posed by the site.

Completion of this IA included reviewing site information, determining regional characteristics, collecting receptor information within the site's range of influence, conducting a site visit, executing a site-specific sampling plan, and producing this report.

This document includes site background information (Section 2), field sampling activities and analytical protocols (Section 3), quality assurance/quality control (QA/QC) criteria (Section 4), analytical results reporting and background sampling (Section 5), potential sources (Section 6), migration/exposure pathways and targets (Section 7), removal assessment (Section 8), summary and conclusions (Section 9), and references (Section 10).

2. SITE BACKGROUND

This section describes the site location (subsection 2.1), site description (subsection 2.2), site ownership history (subsection 2.3), site operations and waste characteristics (subsection 2.4), site characterization (subsection 2.5), and summary of investigation locations (subsection 2.6).

2.1 SITE LOCATION

Site Name:	Gorst Creek - Bremerton Auto Wrecking Landfill
CERCLIS ID Number:	WAN001002414
Location:	4275 State Highway 3 SW Port Orchard, Washington 98367
Latitude:	47° 30' 36.40" North
Longitude:	122° 44' 29.40" West
Legal Description:	Township 23N, Range 1W, Section 1, Willamette Meridian
County:	Kitsap County
Site Owner(s):	Carina Trust % William Nilles 12117 196th Avenue KPN Gig Harbor, Washington 98329 (253) 884-1509

2.2 SITE DESCRIPTION

The Gorst Creek - Bremerton Auto Wrecking Landfill is a closed landfill located in the NW¼ of the SW¼ of Section 1, Township 23N, Range 1W, in Kitsap County, Washington, and approximately 1.5 miles west of Gorst, Washington, along the southeast side of State Highway 3 SW (Figures 2-1 and 2-2; EPA 2003b). The site is located approximately 5 miles southwest of Port Orchard and approximately 6 miles south-southwest of Bremerton. The site is identified by the Kitsap County Tax Assessor as parcel 012301-4-022-1005. It is a triangular parcel centered over approximately 700 feet of the Gorst Creek Ravine. Vehicle access to the site can only be obtained from the northeast through the adjacent auto wrecking yard (Airport Auto Wrecking, Too). The Washington State Department of

Transportation owns the property directly north and west of the landfill. This property contains State Highway 3 SW and an easement corridor on either side of the highway.

The landfill was closed by the Kitsap County Health Department in 1989 due to non-conformance with state and local solid waste regulations (KCHD various dates). The site was first permitted as a landfill in 1968, at which time a 24-inch corrugated steel culvert was constructed to allow passage of Gorst Creek through the landfill (Hart Crowser 2000). The ravine has been filled with waste and overburden. During times of heavy precipitation, more than 2 inches in a 24-hour period, the ravine on the south side of the landfill fills with water. The water is unable to pass through the culvert due to damage of the culvert approximately 250 feet downstream of the culvert entrance.

2.3 SITE OWNERSHIP HISTORY

The site began operating as a landfill in 1950 under the name Ames Auto Wrecking. At this time the property was owned by Mel Marler of Bremerton, Washington, who operated the landfill until 1972. In 1972, the property was purchased by Earl King and Louis King. In 1973, K. R. Crawford and Clara D. Crawford, and Northern, Inc., obtained ownership in a portion of the site. Mr. and Mrs. King, Mr. and Mrs. Crawford, and Northern, Inc., operated the landfill under the name of Ames Refuse - Bremerton Auto Wrecking, Inc., until 1980. In 1980, the property was obtained by Sid Uhinck and Lucille Uhinck who operated the site as Bremerton Auto Wrecking, Inc., until its closure in 1989. Ownership from the time of closure until 2001 is unknown. In February 2001, the property was obtained from Kitsap County Treasurer by Vern L. Padgett of Tacoma, Washington. In February 2002, Mr. Padgett deeded the property to the Carina Trust. In November 2002, the property was acquired from the Carina Trust by the current owner William Nilles. (KCHD various dates)

2.4 SITE OPERATIONS AND WASTE CHARACTERISTICS

The Gorst Creek - Bremerton Auto Wrecking Landfill was an active facility from 1950 until approximately 1989 (Hart Crowser 2000). Although landfill operations began in 1950, permits for the site were only obtained from 1964 through 1987 (KCHD various dates). Kitsap County Health Department files indicate the landfill was actively receiving wastes during periods when there were no permits. The Bremerton-Kitsap County Department of Public Health issued a refuse disposal permit for the period 1968 to 1972. For the periods 1973 to 1977 and 1977 to 1978, the Bremerton-Kitsap County Department of Public Heath issued a permit to operate a solid waste site. In 1979, the Bremerton-Kitsap County Department of Public Health issued a permit with specific conditions requiring the landfill to be

operated in compliance with local and state regulations. From 1985 to 1989, the landfill was permitted by the Kitsap County Health Department as a demolition disposal site (Fisher 1997). In addition to the permitted wastes received at the site, additional information indicates that the Gorst Creek - Bremerton Auto Wrecking Landfill received other wastes such as medical waste from the Puget Sound Naval Shipyard (PSNS; E & E 2003b).

On March 19, 1997, after a significant rainfall event (7.3 inches in 24 hours), Gorst Creek backed up behind the landfill and flooded across the surface of the landfill which caused a portion of the northwest slope of the landfill to fail and wash into Gorst Creek on the northwest side of the landfill (Hart Crowser 2000). Landfill debris were found approximately 0.5 mile downstream in Gorst Creek (Holdcroft 2003). After this slope failure, two rip rap catchment berms with corrugated metal 24-inch culverts were installed on Gorst Creek in an attempt to stop future possible slope failures from washing landfill debris downstream. However, in January 2002, after another heavy rainfall event, Gorst Creek backed up and flooded over the landfill resulting in another slope failure (Holdcroft 2003). This slope failure was smaller than the 1997 failure; however, again landfill debris was released into Gorst Creek, when the most upstream rip rap catchment berm was destroyed by the flood event. The lower catchment berm remained in place and is still present today (E & E 2003b).

The site is estimated to contain approximately 150,000 cubic yards of waste (Hart Crowser 2000). Potential contaminants of concern (COCs) at the landfill include chlorinated pesticides (pesticides), polychlorinated biphenyls (PCBs), Target Analyte List (TAL) metals, semivolatile organic compounds (SVOCs), and volatile organic compounds (VOCs).

2.5 SITE CHARACTERIZATION

This subsection describes previous investigations and the START-2 site visit.

2.5.1 Previous Investigations

In 1999 and 2000, Hart Crowser conducted a site hazard assessment (SHA) of the Gorst Creek - Bremerton Auto Wrecking Landfill for the PSNS. The SHA was conducted to determine the nature and possible extent of contamination at the Gorst Creek - Bremerton Auto Wrecking Landfill. PSNS was working in accordance with the Kitsap County Department of Health to assist in the cleanup from previous disposal of PSNS medical wastes at the facility. During the study, Hart Crowser conducted a property boundary and elevation survey, a limited landfill soil and slope stability assessment, and a

characterization of the area hydrogeology. In addition, surface soil, sediment, groundwater, and surface water samples were collected to assess levels of contamination at the site (Hart Crowser 2000).

Based on the reconnaissance information collected by geotechnical engineers, Hart Crowser noted that there was evidence of debris flows and surface erosion near the northwest limits of the landfill. In this area, the underlying native soil material contained over-steepened slopes that were particularly susceptible to surface erosion and slope failures The natural slopes along the sides of the ravine were estimated to be about 36 degrees to 40 degrees from horizontal. In general, the natural slopes appeared to contain evidence of deep-seated sliding or slumps. Debris flows were primarily attributed to surface water erosion and groundwater seepage. From this information, Hart Crowser determined that if the buried culvert pipe running beneath the landfill was broken or truncated, it would further contribute to the instability of the landfill. (Hart Crowser 2000)

During the environmental investigation portion of the SHA, Hart Crowser collected surface soil, sediment, groundwater, and surface water samples. Four discrete surface soil samples, including one background sample, were collected (Table 2-1; Figure 2-3). In addition, three 3-part composite surface soil samples were collected (Figure 2-3). The surface soil samples were analyzed for total petroleum hydrocarbons as gasoline (TPHG), total petroleum hydrocarbons as diesel (TPHD), pesticides/PCBs, priority pollutant metals, leachable priority pollutant metals by toxicity characteristic leaching procedure (TCLP), VOCs, and SVOCs (Hart Crowser 2000). Sixteen pesticides/PCBs, 22 SVOCs, and nine priority pollutant metals were detected above the instrument detection limit. No VOCs were detected above the instrument detection limit in these soil samples (Hart Crowser 2000).

Four sediment samples, including one background and three composite samples, were collected from Gorst Creek downstream of the landfill (Table 2-2). Sediment samples were analyzed for TPHG, TPHD, pesticides/PCBs, priority pollutant metals, TCLP priority pollutant metals, SVOCs, VOCs, and total organic carbon (Hart Crowser 2000). One pesticide, 14 SVOCs, and seven priority pollutant metals were detected above the instrument detection limit. No VOCs were detected above the instrument detection limit in the sediment samples (Hart Crowser 2000).

One groundwater sample was collected from the City of Bremerton Public Works and Utilities monitoring well (Well BR-11), which is located on Gorst Creek approximately 0.15 mile downgradient of the site. Groundwater samples were analyzed for PCBs, total and dissolved priority pollutant metals, VOCs, SVOCs, and total suspended solids (Hart Crowser 2000). No analytes were detected above the instrument detection limit (Hart Crowser 2000).

Two surface water samples were collected from Gorst Creek, one upstream and one downstream of the landfill (Figure 2-3). Surface water samples were analyzed for PCBs, total and dissolved priority pollutants metals, VOCs, SVOCs, total suspended solids, hardness, cations, and anions. Mercury was the only analyte detected above the instrument detection limit in the sample from the upstream sample location. No analytes were detected in the sample from the downstream location. (Hart Crowser 2000)

2.5.2 START-2 Preliminary Assessment

The START-2 conducted a preliminary assessment (PA) of the Gorst Creek - Bremerton Auto Wrecking Landfill in 2003 (E & E 2003b). A site visit for the PA was conducted on January 28, 2003. The START-2 was accompanied by Grant Holdcroft of Kitsap County Health Department, Joanne LaBaw the EPA Task Monitor, and the property owner, Mr. Nilles. The site is covered with blackberry brambles. Gorst Creek flows northwest under the property through a 36-inch corrugated steel culvert. At the time of the site visit, Gorst Creek was backed up on the upgradient side of the landfill. The backup behind the landfill was estimated by Mr. Holdcroft of the Kitsap County Health Department, who had previously visited the site in dry conditions, to be approximately 30 feet deep by 400 feet along the creek bed. Debris was floating in the backed up water at the time of the site visit. The slope of the landfill in this upgradient area is approximately 45 degrees with debris visible on the slopes. (E & E 2003b)

Based on the existence of on-site and off-site contamination from the Hart Crowser 2000 sampling event, the existence of downstream targets, and the existence of site characteristics that must be present for a site to be eligible for a removal action (see Section 8 for a discussion of these site characteristics), an IA was recommended for this site.

2.6 SUMMARY OF IA INVESTIGATION LOCATIONS

Based on a review of historical and background information which was supplemented by the PA, areas and features within the site were identified for investigation during the IA as potential Comprehensive Environmental Response, Compensation, and Liability Act hazardous substance sources. In addition, on- and off-site locations were identified as possible receptors of contamination originating from these sources. Those potential sources and receptors are listed below.

Table 2-1

HART CROWSER 2000 SURFACE SOIL SAMPLES ANALYTICAL RESULTS SUMMARY
GORST CREEK - BREMERTON AUTO WRECKING LANDFILL INTEGRATED ASSESSMENT
PORT ORCHARD, WASHINGTON

Sample ID	GL-SS-01	GL-SS-02	GL-SS-03	GL-SS-04	GL-SS-05	GL-SS-06	GL-SS-07	GL-SS-08
Sample Date	1/10/2000	1/10/2000	1/10/2000	1/10/2000	1/10/2000	1/10/2000	1/10/2000	1/10/2000
Description	Background	Discrete Grab			Composite			Field Duplicate
TAL Metals (mg/kg)								
Antimony	3.6 U	3.0 U	5.9	3.1 U	4.7	3.2 U	3.3 U	3.2 U
Arsenic	2.3	5.2	1.7	1.2	0.91	1.6	1.6	1.4
Cadmium	0.36 U	1	0.83	0.31 U	0.3 U	0.32 U	0.33 U	0.32 U
Chromium	23	28	30.3	25.2	22.4	19	27.9	19.8
Copper	12.5	34.1	64.8	30.7	22.3	10	13	11.7
Lead	10	235	57.9	32.8	17.8	12.7	16.3	10.6
Mercury	0.045 U	0.1	0.25	0.094	0.046	0.046 U	0.047 U	0.049 U
Nickel	32.1	35.7	44	28.5	34.3	24.4	35.4	32.1
Zinc	31.5	178	235	105	77.4	27.7	44.5	40.3

Source: Hart Crowser 2000.

Note: Bold type indicates the sample results is above the instrument detection limit.

Key:

DDD = Dichlorodiphenyldichloroethane.
DDE = Dichlorodiphenyldichloroethylene.
DDT = Dichlorodiphenyltrichloroethane.
ID = Identification.
J = Estimated value.
mg/kg = Milligrams per kilogram.
PCBs = Polychlorinated biphenyls.
SVOCs = Semivolatile organic compounds.
TAL = Target Analyte List.
U = Not detected at indicated detection limit.

Table 2-2

HART CROWSER 2000
SEDIMENT SAMPLES ANALYTICAL RESULTS SUMMARY
GORST CREEK - BREMERTON AUTO WRECKING LANDFILL
INTEGRATED ASSESSMENT
PORT ORCHARD, WASHINGTON

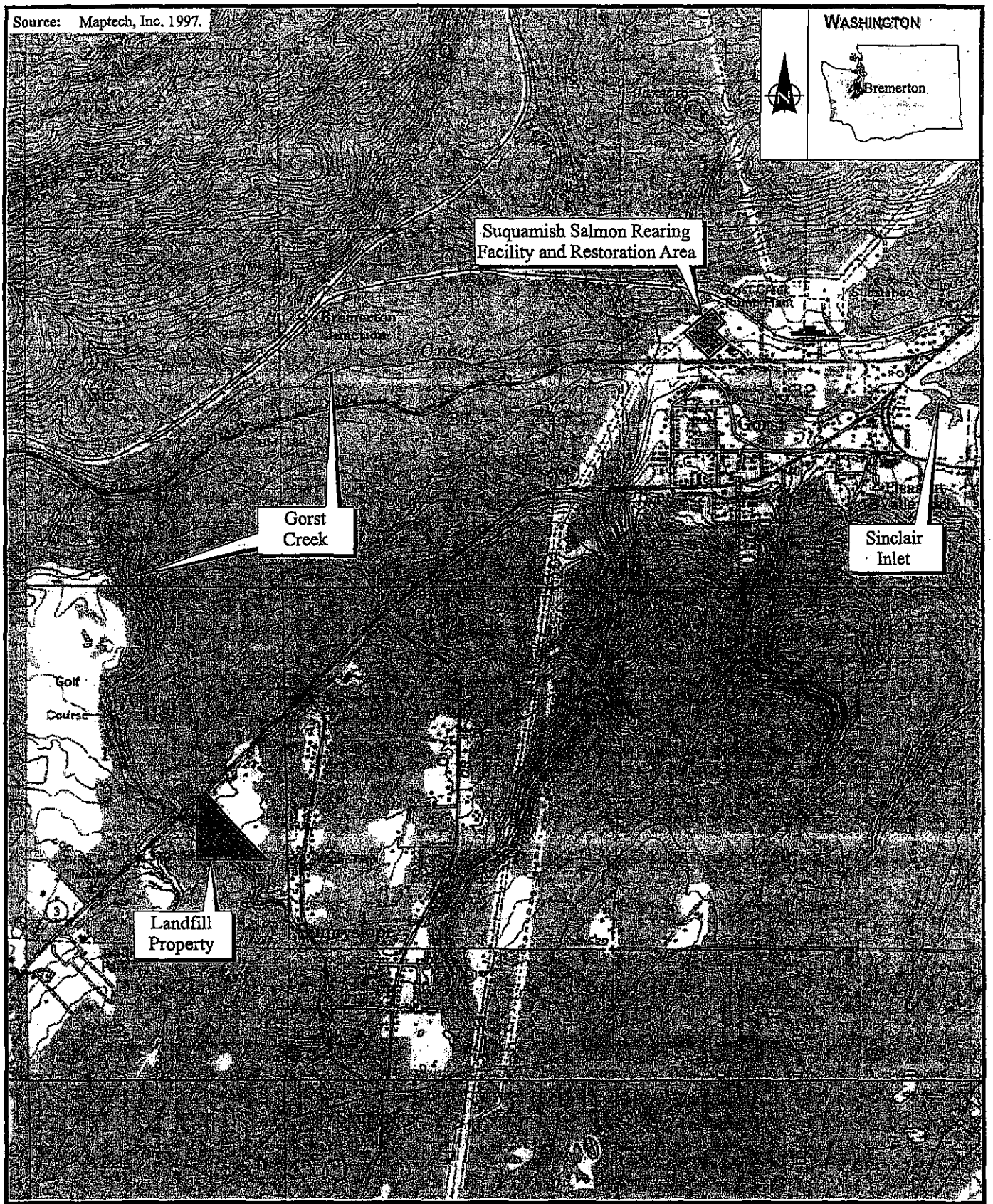
Sample ID	GL-SED-01	GL-SED-02	GL-SED-03	GL-SED-04
Sample Date	1/10/2000	1/11/2000	1/11/2000	1/11/2000
Description	Background	Composite		
Pesticides/PCBs (mg/kg)				
4,4'-DDT	0.0043 U	**0.012 J**	0.0041 U	0.0041 U
SVOCs (mg/kg)				
4-Methylphenol	0.43 U	**0.017 J**	0.4 U	0.4 U
Benzo(a)anthracene	0.43 U	**0.045 J**	0.4 U	0.4 U
Benzo(a)anthracene	0.43 U	**0.045 J**	0.4 U	0.4 U
Benzo(b)fluoranthene	**0.43**	**0.058 J**	0.4 U	0.4 U
Benzo(k)fluoranthene	**0.43**	**0.042 J**	0.4 U	0.4 U
Butylbenzylphthalate	0.43 U	**0.095 J**	0.4 U	0.4 U
Chrysene	0.43 U	**0.073 J**	0.4 U	0.4 U
Di-n-butylphthalate	0.43 U	**0.03 J**	0.4 U	0.4 U
Di-n-octylphthalate	0.43 U	**0.027 J**	0.4 U	0.4 U
Fluoranthene	0.43 U	**0.097 J**	0.4 U	0.4 U
Indeno(1,2,3-cd)pyrene	0.43 U	**0.045 J**	0.4 U	0.4 U
Pentachlorophenol	1.1 U	**0.036 J**	1 U	1 U
Phenanthrene	0.43 U	**0.06 J**	0.4 U	0.4 U
Pyrene	0.43 U	**0.097 J**	0.4 U	0.4 U
TAL Metals (mg/kg)				
Antimony	3.4 U	**7.6**	3.2 U	3.2 U
Arsenic	**2**	**3.5**	**27.7**	**2.1**
Chromium	**35.7**	**30.5**	**17.3**	**30.3**
Copper	**11.3**	**159**	**12.7**	**19.7**
Lead	**4.2**	**113**	**16.6**	**12.4**
Nickel	**54**	**53.2**	**23.1**	**32.1**
Zinc	**45.4**	**108**	**76.4**	**97.3**

Source: Hart Crowser 2000.

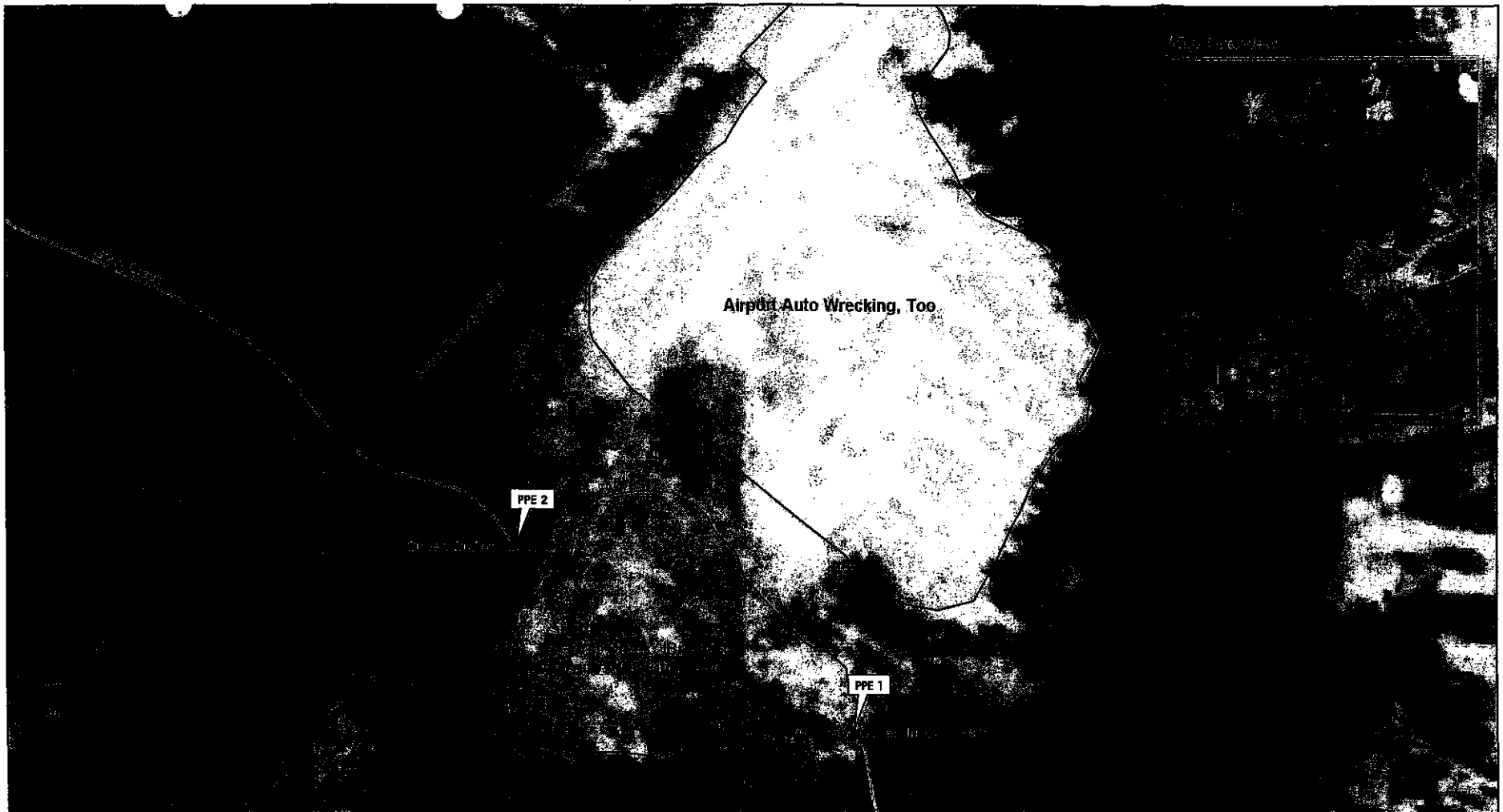
Note: Bold type indicates the sample result is above the detection limit.

Key:

DDT = Dichlorodiphenyltrichloroethane.
ID = Identification.
J = Estimated value.
mg/kg = Milligrams per kilogram.
PCBs = Polychlorinated biphenyl.
SVOCs = Semivolatile organic compounds.
TAL = Target Analyte List.
U = Not detected at indicated detection limit.



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	GORST CREEK-BREMERTON AUTO WRECKING LANDFILL INTEGRATED ASSESSMENT Port Orchard, Washington	Figure 2-1 SITE VICINITY MAP		
	0 .25 .5 Approximate Scale in Miles	Date: 6-1-04	Drawn by: AES	10:START-2\03070009\S866\fig 2-1



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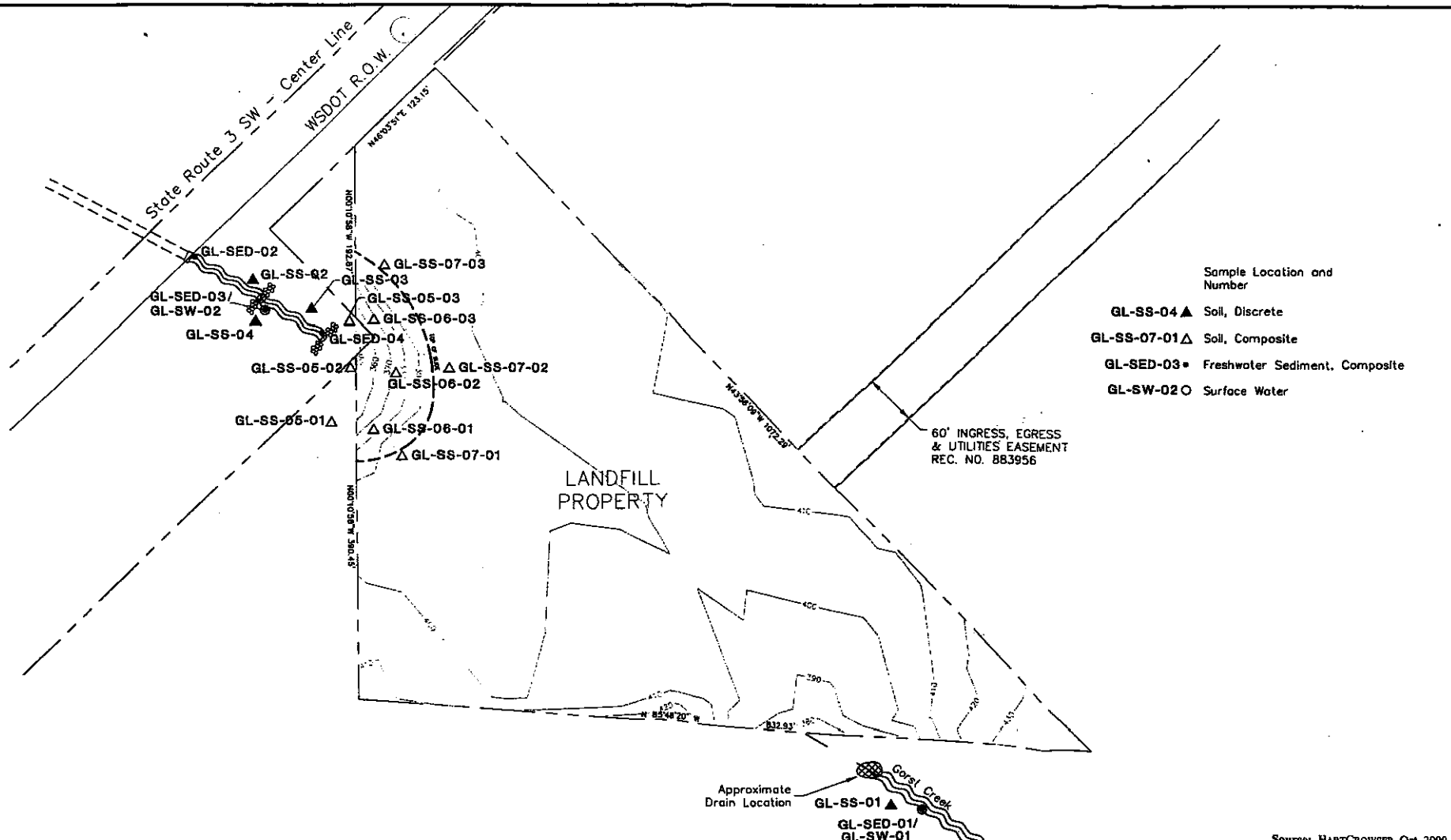
N W E S
0 30 60 120 180 240 300
Feet

Map Reference: USGS Digital OrthoPhoto Quarter Quadrangle - Bremerton West, July 7, 1994

Gorst Creek - Bremerton Auto Wrecking Landfill
Integrated Assessment
Port Orchard, Washington

Figure 2-2
SITE LAYOUT MAP

Date:	Drawn by:	Job Number:
02/12/2004	avh	001281.0291.01tA



Source: HARTCROWSER, Oct. 2000.

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0 100 200
Approximate Scale in Feet

GORST CREEK-BREMERTON
AUTO WRECKING LANDFILL
INTEGRATED ASSESSMENT
Port Orchard, Washington

Figure 2-3
2000 SAMPLE LOCATION MAP

Date:	Drawn by:	
6/1/04	AES	10:START-2\03070009\S866\fig 2-3

3. FIELD ACTIVITIES AND ANALYTICAL PROTOCOL

A sampling quality assurance plan (SQAP) was developed by the START-2 prior to field sampling (E & E 2003a). The SQAP was based upon a review of background information, interviews with site representatives, and a PA conducted by the START-2 in 2003. The SQAP describes the sampling strategy, sampling methodology, and analytical program used to investigate potential hazardous substance sources and potential targets. With few exceptions, IA field activities were conducted in accordance with the approved SQAP. Deviations from the SQAP were approved by the EPA and are described, when applicable, in the sampling location discussions in Section 6 (source areas) and Section 7 (target areas). Sample plan alteration forms are provided in Appendix A.

The IA field sampling event was conducted from November 10 to 12, 2003. A total of 46 samples (7 surface soil, 27 subsurface soil, 3 groundwater, 3 surface water, and 6 sediment), including background samples but excluding QA (rinsate) samples, were collected from on- and off-site locations. Sample types and methods of collection are described below. A list of all samples collected for laboratory analysis under the IA is contained in Table 3-1. Photographic documentation of IA field activities is included as Appendix B. One roll of film suffered water damage in the field, and prints from this roll could not be made; however, the photograph log is attached for descriptive purposes.

Alphanumeric identification numbers applied by the START-2 to each sample location (e.g., SS01SS) are used in the report as the sample location identifiers. Sample location identifiers used for the co-located surface and subsurface soil samples were given a six-digit alphanumeric identification number followed by the bottom depth of the sample (e.g. SS01SB04). Sample locations are provided in Figure 3-1.

This section describes sampling methodology (subsection 3.1), analytical protocol (subsection 3.2), Global Positioning System (GPS; subsection 3.3), and investigation-derived waste (IDW; subsection 3.4).

3.1 SAMPLING METHODOLOGY

The standard operating procedures for sample collection presented in the SQAP were followed except where noted. In general, soil and sediment sample materials for all analyses except VOCs were

homogenized in dedicated stainless steel bowls using dedicated stainless steel spoons prior to containerization. Organic and gravelly materials and landfill debris were removed from samples as much as possible prior to placing the aliquots in pre-labeled sample containers. The aliquot of each sample being collected for VOC analysis was placed directly into sample containers prior to homogenization. All samples were stored in iced coolers that were maintained continuously under chain of custody.

Prior to sampling, the START-2 had blackberry brambles removed from four transects across the landfill to allow the drill rig to enter the landfill area.

This subsection describes collection of surface soil samples, subsurface soil samples, groundwater, surface water, and sediment samples.

3.1.1 Surface Soil Samples

A total of six surface soil samples (LF01, LF02, LF03, LF04, LF05, and LF06) were collected from the Gorst Creek - Bremerton Auto Wrecking Landfill site; one background surface soil sample (BG04) was collected from the adjacent Airport Auto Wrecking, Too property (Figure 3-1). The surface soil samples were discrete-located grab samples collected from potential on-site source areas. The surface soil samples were collected from 0 to 6 inches below ground surface (bgs) using dedicated stainless steel spoons and bowls.

3.1.2 Subsurface Soil Samples

A total of 26 subsurface soil samples and one background subsurface soil sample were collected from 7 direct push technology soil borings (LF01 through LF06 and BG01; Figure 3-1). All soil samples collected from the homogenized 0- to 4-foot bgs interval are considered to be subsurface soil samples for this report. Each boring was continuously logged and sampled to the total depth, typically 20 feet. Soil was sampled from each boring at five intervals (0 to 4 feet bgs, 4 to 8 feet bgs, 8 to 12 feet bgs, 12 to 16 feet bgs, and 16 to 20 feet bgs). At borehole LF01, samples were only collected to a depth of 12 feet because recovery at 12 to 16 and at 16 to 20 feet consisted solely of fiberglass insulation and wood debris in both intervals. At borehole LF02, samples were only collected to a depth of 16 feet because the 16 to 20 foot interval consisted only of glass, wood debris, and plastic. At borehole LF06, samples were only collected to a depth of 16 feet because groundwater was encountered at this depth.

After the direct push-probe sampler was driven to the designated sample depth, the soil contents of the 4-foot-long, dedicated acetate liner were screened with a flame-ionization/photo-ionization detector for volatile organics for health and safety purposes. After screening, the VOC aliquot was

collected directly from the acetate liner using a dedicated stainless steel spoon, and placed directly into prelabeled jars. After the VOC aliquot was collected, the remaining sample material was transferred to a dedicated stainless steel bowl, homogenized, and then placed in prelabeled sample containers for pesticide/PCB, TAL metal, and SVOC analyses. The direct push technology sampler was decontaminated between sample locations. One rinsate sample (RS01) was collected to ensure decontamination procedures were adequate. After sample collection, the borehole was abandoned according to the requirements of the state of Washington. For each borehole a Washington state registered geologist completed borehole drill reports, the reports were then reviewed by a professional engineer prior to being sent to the Washington State Department of Ecology (copies are provided in Appendix C).

3.1.3 Groundwater Samples

A total of three groundwater samples (including one background sample) were collected (Figure 3-1). One sample (LF06GW) was collected from an on-site borehole. This sample was collected using dedicated Teflon tubing with a peristaltic pump. Two groundwater samples (MW01GW and BG01GW) were collected from nearby monitoring wells. Prior to sampling, three volumes of well water were purged from the well and water quality parameters were measured using a Horiba U-10 water quality meter. Water quality readings were taken to verify that the parameters had stabilized prior to sample collection. After purging and stabilization of the well water, a dedicated Teflon bailer was lowered into the well and water was collected. The sample material was transferred from the bailer to prelabeled containers for pesticides/PCB, TAL metals, SVOC, and VOC analyses.

All groundwater sample aliquots requiring preservative were preserved immediately after sample collection.

3.1.4 Surface Water Samples

A total of three surface water samples (including 1 background) were collected from Gorst Creek (Figure 3-1). Two surface water samples were collected from each of the site's probable points of entry (PPEs). Sample GC03SW was collected from the PPE (PPE 1) located on the southeast side of the landfill. The sample was collected approximately 10 feet upstream of the culvert opening. Sample GC04SW was collected from the downstream PPE (PPE 2) located on the northwest side of the landfill. One background sample BG02SW was collected from the headwaters of Gorst Creek, approximately 0.3 mile upstream of PPE 1. All surface water samples were co-located with respective sediment

samples. The samples were collected by dipping a dedicated 1-liter polyethylene bottle into the creek and then transferring the water to prelabeled sample containers. All surface water sample aliquots requiring preservative were preserved immediately after sample collection.

3.1.5 Sediment Samples

A total of six sediment samples (including one background sample) were collected from on-site and off-site locations (Figure 3-1). Sample GC03SD was co-located with surface water sample GC03SW and was collected from the upstream PPE (PPE 1) located on the southeast side of the landfill. The sample was collected approximately 10 feet upstream of the culvert opening. Sample GC04SD was co-located with surface water sample GC04SW and was collected from the downstream PPE (PPE 2) located on the northwest side of the landfill. One background sample BG03SD was co-located with surface water sample BG02SW and was collected from the headwaters of Gorst Creek, approximately 0.3 mile upstream of PPE 1. Sample GC02SD was collected approximately 1,000 feet upstream of PPE 1 near the high water mark of previous flood events along the bank of Gorst Creek. Sample GC05SD was collected approximately 500 feet downstream of PPE 2 on the opposite side of State Highway 3 SW. Sample GC06SD was collected approximately 250 feet downstream of the fish rearing facility on Gorst Creek. All sample locations were discrete grab. The samples were collected using dedicated stainless steel spoons. The sample material, except for the VOC aliquot, were scooped into stainless steel bowls, homogenized, and then transferred to pre-labeled sample containers. The VOC aliquot was collected by transferring the material directly into pre-labeled sample containers, without homogenization.

3.2 ANALYTICAL PROTOCOL

Analytical methods applied to IA samples include Contract Laboratory Program Analytical Services (CLPAS) TAL metals (CLPAS ILM04.1), SVOCs (CLPAS OLM04.3), VOCs (CLPAS OLM04.3), and pesticides/PCBs (CLPAS OLM04.3). These analytical suites were applied to samples in varying combinations based on the sample location and the expected contaminants at each location. Analyses of samples collected during the IA for SVOCs, VOCs, and pesticides/PCBs were performed by Envirosystems, Inc., of Columbia, Maryland. TAL metal analyses were performed by the Chemtech Consulting Group, of Mountainside, New Jersey.

3.3 GLOBAL POSITIONING SYSTEM

Trimble Pathfinder Professional GPS survey units and Corvalis data loggers were used by the START-2 personnel to approximate the sample location coordinates surface and subsurface soil, groundwater, surface water, and sediment samples. Recorded GPS coordinates by sample point are listed in Appendix D.

3.4 INVESTIGATION-DERIVED WASTE

IDW generated during the IA sampling effort consisted of solid disposable sampling equipment and approximately 55 gallons of decontamination and purge water. The purge water was from the monitoring well sampling and the decontamination water was from decontaminating the Geoprobe samplers which were used in the collection of subsurface soil sampling. The disposable sampling equipment IDW was disposed of as non-hazardous waste at a local municipal landfill. The decontamination and purge water IDW was disposed of as non-hazardous waste by the START-2 on March 3, 2004. No IDW generated by the START-2 remains at the site.

Table 3-1

SAMPLE COLLECTION AND ANALYTICAL SUMMARY
GORST CREEK - BREMERTON AUTO WRECKING LANDFILL INTEGRATED ASSESSMENT
PORT ORCHARD, WASHINGTON

EPA Sample ID	Station Location ID	CLP Organic ID	CLP Inorganic ID	Date	Time	Matrix	Depth (feet bgs)	Sampler	ANALYSES				Sample Description
									Pesticides/PCBs	SVOCs	TAL Metals	VOCs	
03464400	LF01SS	J2768	MJ2768	11/10/03	12:25	SS	0-0.5	RN	X	X	X	X	Sample collected from Borehole LF01, clayey silt, light brown, moist, slightly plastic, soft.
03464401	LF01SB04	J2769	MJ2769	11/10/03	12:45	SB	0-4	RN	X	X	X		Sample collected from Borehole LF01, clayey silt, moderate brown, moist, slightly plastic, soft with root fragments, concrete, and brick debris.
03464402	LF01SB08	J2770	MJ2770	11/10/03	13:25	SB	4-8	RN	X	X	X	X	Sample collected from Borehole LF01, sandy silt with clay, dark brown, moist, slightly plastic, firm with lenses of gravel and increasing sand.
03464403	LF01SB12	J2771	MJ2771	11/10/03	13:30	SB	8-12	RN	X		X	X	Sample collected from Borehole LF01, silty sand, fine grained, light gray, moist, loose, with significant wood debris, some gravel.
03464404	LF02SS	J2772	MJ2772	11/10/03	14:20	SS	0-0.5	RN	X	X	X	X	Sample collected from Borehole LF02, clayey silt, light brown, moist, soft, slightly plastic with root and wood debris.
03464405	LF02SB04	J2773	MJ2773	11/10/03	14:25	SB	0-4	RN	X	X	X	X	Sample collected from Borehole LF02, clayey silt with sand, light brown, dry to moist, soft, slightly plastic with gravel and wood debris.
03464406	LF02SB08	J2774	MJ2774	11/10/03	14:30	SB	4-8	RN	X	X	X	X	Sample collected from Borehole LF02, silty sand, light brown to gray, dry, loose, fine grained with silt, gravel with wood debris, glass fragments, brick fragments found in layers.
03464407	LF02SB12	J2775	MJ2775	11/10/03	14:45	SB	8-12	RN	X	X	X	X	Sample collected from Borehole LF02, silty sand, light brown, dry, loose, fine grained with silt, gravel, wood debris, plastic.
03464408	LF02SB16	J2776	MJ2776	11/10/03	15:00	SB	12-16	RN	X	X	X	X	Sample collected from Borehole LF02, silty sand, light brown, dry, loose, fine grained with glass fragments, wood, brick, plastic (wood is moist, possibly stained).
03464409	LF03SS	J2777	MJ2777	11/11/03	9:40	SS	0-0.5	RN	X	X	X	X	Sample collected from Borehole LF03, clayey silt with gravel, wood debris, light brown, moist, some plasticity.
03464410	LF03SB04	J2778	MJ2778	11/11/03	10:00	SB	0-4	RN	X	X	X	X	Sample collected from Borehole LF03, well graded sand, light brown, loose, dry, fine to coarse, with gravel and concrete debris.
03464411	LF03SB08	J2779	MJ2779	11/11/03	10:20	SB	4-8	RN	X	X	X	X	Sample collected from Borehole LF03, well graded sand, light brown, loose, dry, fine to coarse grained with charred wood, brick and concrete debris, and gravel.

Key is located at the end of the table.

Table 3-1

SAMPLE COLLECTION AND ANALYTICAL SUMMARY
GORST CREEK - BREMERTON AUTO WRECKING LANDFILL INTEGRATED ASSESSMENT
PORT ORCHARD, WASHINGTON

EPA Sample ID	Station Location ID	CLP Organic ID	CLP Inorganic ID	Date	Time	Matrix	Depth (feet bgs)	Sampler	ANALYSES				Sample Description
									Pesticides /PCBs	SVOCs	TAL Metals	VOCs	
03464412	LF03SB12	J2780	MJ2780	11/11/03	11:05	SB	8-12	RN	X	X	X	X	Sample collected from Borehole LF03, well graded sand, light brown, dry, loose, fine to coarse with minor amount of gravel, wood debris.
03464413	LF03SB16	J2781	MJ2781	11/11/03	11:25	SB	12-16	RN	X	X	X	X	Sample collected from Borehole LF03, well graded sand, light gray, dry, loose, fine to coarse with gravel, wood debris, black, charred or stained wood/soil.
03464414	LF03SB20	J2782	MJ2782	11/11/03	11:50	SB	16-20	RN	X	X	X	X	Sample collected from Borehole LF03, well graded sand with fines, oily liquid present with odor. Wood debris and some concrete.
03464415	LF04SS	J2783	MJ2783	11/11/03	13:20	SS	0-0.5	RN	X	X	X	X	Sample collected from Borehole LF04, poorly graded sand, moderate brown, loose, dry, medium grained sand with roots and vegetative matter.
03464416	LF04SB04	J2784	MJ2784	11/11/03	13:30	SB	0-4	RN	X	X	X	X	Sample collected from Borehole LF04, poorly graded sand, loose, dry, medium grained sand with two 3-inch lenses of gravel.
03464417	LF04SB08	J2785	MJ2785	11/11/03	13:40	SB	4-8	RN	X	X	X	X	Sample collected from Borehole LF04, poorly graded sand with silt, moderate brown, medium dense, dry, medium grained, some gravel and brick debris.
03464418	LF04SB12	J2786	NA	11/11/03	13:50	SB	8-12	RN	X			X	Sample collected from Borehole LF04, well graded sand, moderate brown, fine to coarse, dry, loose with gravel and charred wood.
03464419	LF04SB16	J2787	MJ2787	11/11/03	14:00	SB	12-16	RN	X	X	X	X	Sample collected from Borehole LF04, well graded sand, moderate brown, moist, loose, fine to coarse sand with plastic debris and gravel, small amount of black, oily liquid with charred wood.
03464420	LF04SB20	J2788	NA	11/11/03	14:10	SB	16-20	RN	X			X	Sample collected from Borehole LF04, well graded sand, dark brown to black, moist, loose, fine to coarse grained, with gravel and wood debris.
03464421	RS01WT	J2789	MJ2789	11/11/03	15:00	QA	NA	RN	X	X	X	X	Rinsate from Geoprobe sampling shoe, trip blank.
03464422	MW01GW	J2790	MJ2790	11/10/03	11:30	GW	NA	BM	X	X	X	X	Sample collected from monitoring well BR-11, no color, no odor.
03464423	BG01GW	J2791	MJ2791	11/10/03	15:55	GW	NA	BM	X	X	X	X	Sample collected from monitoring well BR-9, background groundwater, no color, no odor.
03464424	GC03SW	J2792	MJ2792	11/11/03	10:00	SW	NA	HZ	X	X	X	X	Sample collected from PPE 1, no color, no odor, pH = 6.

Key is located at the end of the table.

Table 3-1

SAMPLE COLLECTION AND ANALYTICAL SUMMARY
GORST CREEK - BREMERTON AUTO WRECKING LANDFILL INTEGRATED ASSESSMENT
PORT ORCHARD, WASHINGTON

EPA Sample ID	Station Location ID	CLP Organic ID	CLP Inorganic ID	Date	Time	Matrix	Depth (feet bgs)	Sampler	ANALYSES				Sample Description
									Pesticides /PCBs	SVOCs	TAL Metals	VOCs	
03464425	GC03SD	J2793	MJ2793	11/11/03	10:10	SD	0-0.5	HZ	X	X	X	X	Sample collected from PPE 1, sandy gravel, very coarse particles, saturated, medium brown.
03464426	GC02SD	J2794	MJ2794	11/11/03	10:35	SD	0-0.5	HZ	X	X	X	X	Sample collected from high point of flood zone on Gorst Creek upgradient of PPE 1, sandy gravel, saturated, medium brown.
03464427	BG02SW	J2795	MJ2795	11/11/03	12:15	SW	NA	HZ	X	X	X	X	Sample collected from headwaters of Gorst Creek, background surface water, no color, no odor.
03464428	BG03SD	J2796	MJ2796	11/11/03	12:20	SD	0-0.5	HZ	X	X	X	X	Sample collected from headwaters of Gorst Creek, background sediment, silty-sandy gravel, wet, dark brown.
03464429	GC05SD	J2797	MJ2797	11/11/03	13:30	SD	0-0.5	HZ	X	X	X	X	Sample collected from north side of Highway 3 on Gorst Creek, gravelly sand, moist, medium brown.
03464430	GC04SW	J2798	MJ2798	11/11/03	14:22	SW	NA	HZ	X	X	X	X	Sample collected from PPE 2, no color, no odor, pH = 6.
03464431	GC04SD	J2799	MJ2799	11/11/03	14:30	SD	0-0.5	HZ	X	X	X	X	Sample collected from PPE 2, gravelly sand, wet, medium brown.
03464432	LF05SS	J27A0	MJ27A0	11/12/03	9:30	SS	0-0.5	RN	X	X	X	X	Sample collected from Borehole LF05, clayey silt with sand, moderate brown, soft, moist, slightly plastic, with wood debris.
03464433	LF05SB04	J27A1	MJ27A1	11/12/03	9:40	SB	0-4	RN	X	X	X	X	Sample collected from Borehole LF05, well graded sand with gravel, moderate brown, dry, fine to coarse, loose, with insulation debris, plastic debris, wood and brick.
03464434	LF05SB08	J27A2	MJ27A2	11/12/03	9:50	SB	4-8	RN	X	X	X	X	Sample collected from Borehole LF05, well graded sand, moderate brown, dry, loose, fine to coarse grained, less debris but some wood, brick, and plastic.
03464435	LF05SB12	J27A3	MJ27A3	11/12/03	10:00	SB	8-12	RN	X	X	X	X	Sample collected from Borehole LF05, well graded sand, moderate brown, dry, loose, fine to coarse grained, with some gravel, insulation, wood, and plastic debris.
03464436	LF05SB16	J27A4	MJ27A4	11/12/03	10:20	SB	12-16	RN	X	X	X	X	Sample collected from Borehole LF05, well graded sand, moderate brown, dry, loose, fine to very coarse grained, with two 2-inch layers including gravel. No significant amount of debris (except at the very top of the sample, could be slough or native soil).

Key is located at the end of the table.

Table 3-1

SAMPLE COLLECTION AND ANALYTICAL SUMMARY
GORST CREEK - BREMERTON AUTO WRECKING LANDFILL INTEGRATED ASSESSMENT
PORT ORCHARD, WASHINGTON

EPA Sample ID	Station Location ID	CLP Organic ID	CLP Inorganic ID	Date	Time	Matrix	Depth (feet bgs)	Sampler	ANALYSES				Sample Description
									Pesticides /PCBs	SVOCs	TAL Metals	VOCs	
03464437	LF05SB20	J27A5	MJ27A5	11/12/03	10:40	SB	16-20	RN	X	X	X	X	Sample collected from Borehole LF05, interbeds of poorly and well graded sand, moderate brown, dry to moist, loose, well graded sand is fine to very coarse grained sand with fine gravel, poorly graded sand is medium grained, no evidence of debris, could be native soil.
03464438	LF06SS	J27A6	MJ27A6	11/12/03	11:25	SS	1-0.5	RN	X	X	X	X	Sample collected from Borehole LF06, clayey silt, moderate brown, soft, moist, slight plasticity, with roots and plastic debris.
03464439	LF06SB04	J27A7	MJ27A7	11/12/03	11:30	SB	0-4	RN	X	X	X	X	Sample collected from Borehole LF06, clayey silt to well graded sand, fine to coarse grained, dry, loose, moderate brown, with wood, brick, concrete, plastic, and glass debris.
03464440	LF06SB08	J27A8	MJ27A8	11/12/03	11:35	SB	4-8	RN	X	X	X	X	Sample collected from Borehole LF06, well graded sand, fine to coarse grained, light brown, dry, loose with some gravel, concrete and wood debris, layer of black, oily stained wood debris (could be creosote) at 5 feet bgs.
03464441	LF06SB12	J27A9	MJ27A9	11/12/03	11:40	SB	8-12	RN	X	X	X	X	Sample collected from Borehole LF06, well graded sand, fine to coarse grained, wet, black to brown (black is stain from oily liquid), loose, most of the sample is wood debris and broken glass. An oily black liquid is saturating the wood debris. Creosote-like odor.
03464442	LF06SB16	J27B0	NA	11/12/03	11:50	SB	12-16	RN	X	X			Sample collected from Borehole LF06, the entire sample was wood debris. The wood is saturated with black oily liquid.
03464443	BG04SS	J27B1	MJ27B1	11/12/03	13:45	SS	0-0.5	RN	X	X	X	X	Sample collected approximately 1,000 feet northeast of site, background surface soil, sandy silt, moderate brown, dry, soft, slightly plastic, no man-made debris, sand and gravel.
03464444	BG04SB04	J27B2	MJ27B2	11/12/03	13:50	SB	0-4	RN	X	X	X	X	Sample collected approximately 1,000 feet northeast of the site, background subsurface soil, well graded sand, moderate brown, loose, dry, fine to coarse grained with some gravel, no debris evident.
03464445	LF06GW	J27B3	NA	11/12/03	15:45	GW	NA	RN	X	X		X	Sample collected from Borehole 6, black oily substance floating in water.

Key is located at the end of the table.

Table 3-1

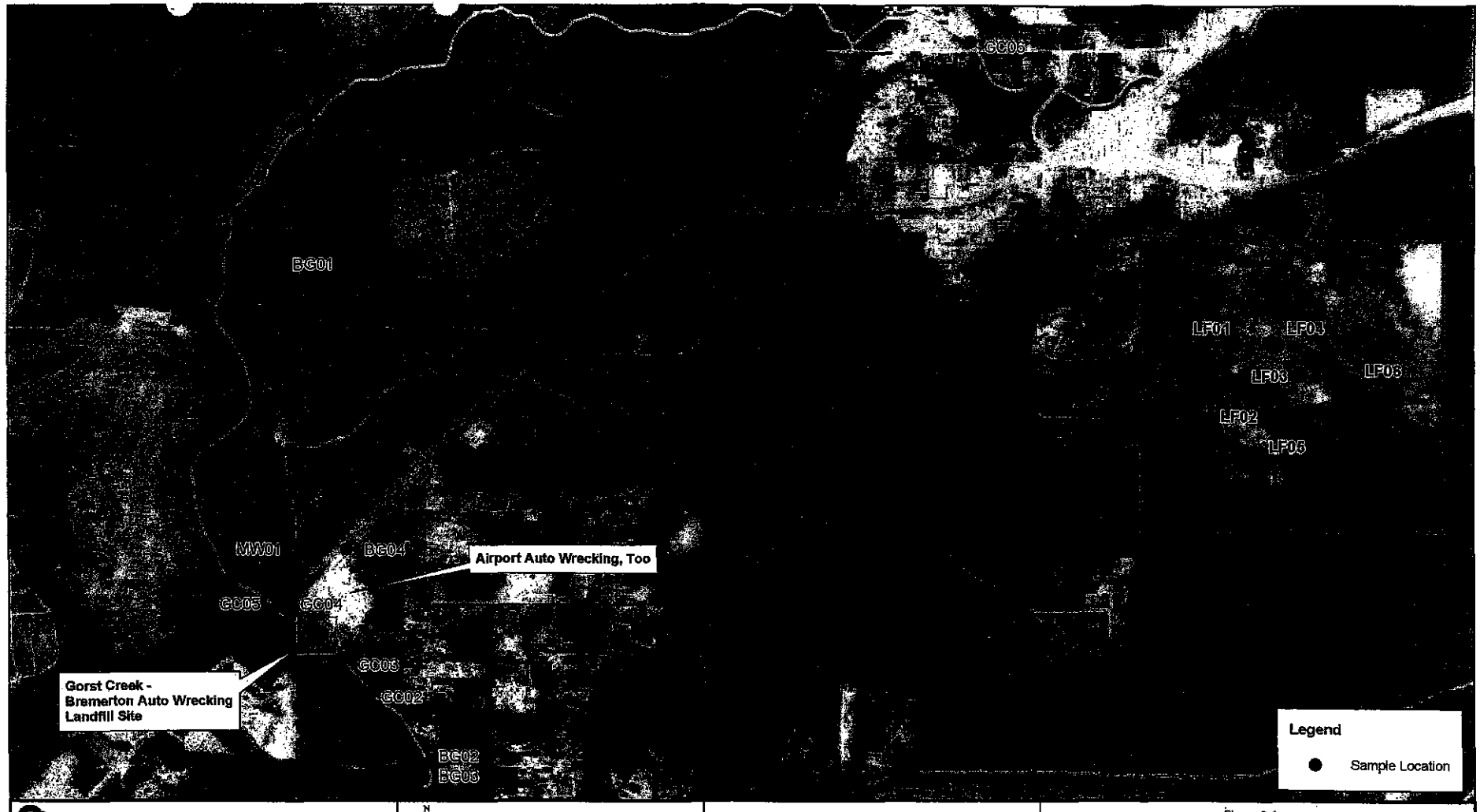
SAMPLE COLLECTION AND ANALYTICAL SUMMARY
GORST CREEK - BREMERTON AUTO WRECKING LANDFILL INTEGRATED ASSESSMENT
PORT ORCHARD, WASHINGTON

EPA Sample ID	Station Location ID	CLP Organic ID	CLP Inorganic ID	Date	Time	Matrix	Depth (feet bgs)	Sampler	ANALYSES				Sample Description
									Pesticides/PCBs	SVOCs	TAL Metals	VOCs	
03464446	IDW01WT	J27B4	MJ27B4	11/12/03	16:30	QA	NA	RN	X	X	X		Sample collected from investigation derived waste and purge water.
03464447	GC06SD	J27B5	MJ27B5	11/12/03	16:40	SD	0-0.5	BM	X	X	X	X	Sample collected approximately 250 feet downstream of fish hatchery on Gorst Creek, gravelly sand, wet, gray, with strong organic odors.

Key:

bgs = Below ground surface.
BM = Ben Martich.
CLP = Contract Laboratory Program.
EPA = United States Environmental Protection Agency.
GW = Groundwater.
HZ = Howard Zorzi.
ID = Identification.
NA = Not applicable.
PCBs = Polychlorinated biphenyls.
QA = Quality assurance.
RN = Renee Nordeen.
SB = Subsurface soil.
SD = Sediment.
SS = Surface soil.
SVOCs = Semivolatile organic compounds.
SW = Surface water.
TAL = Target Analyte List.
VOCs = Volatile organic compounds.

Key is located at the end of the table.



ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

N W E S

0 250 500 1,000 1,500 2,000 2,500
Feet

Map Reference: USGS Digital OrthoPhoto Quarter Quadrangle - Bremerton West, July 7, 1994

Gorst Creek - Bremerton Auto Wrecking Landfill
Integrated Assessment
Port Orchard, Washington

Figure 3-1
SAMPLE LOCATION MAP

Date:	Drawn by:	Job Number:
02/12/2004	avh	001281.0291.01IA

4. QUALITY ASSURANCE/QUALITY CONTROL

QA/QC data are necessary to determine precision and accuracy and to demonstrate the absence of interferences and/or contamination of sampling equipment, glassware, and reagents. Specific QC requirements for laboratory analyses are incorporated in the *EPA Contract Laboratory Program Statement of Work for Organic Analyses* (EPA 2003a) and in the *EPA Contract Laboratory Program Statement of Work for Inorganic Analyses* (EPA 2000b). These QC requirements or equivalent requirements were followed for analytical work on the IA. This section describes the QA/QC measures taken for the IA and provides an evaluation of the usability of data presented in this report.

All samples were collected following the guidance of the SQAP (E & E 2003a) for the field activities. Pesticides/PCB, SVOC, and VOC analyses were performed by Envirosystems, Inc., which is located in Columbia, Maryland, a Contract Laboratory Program (CLP) laboratory, following the *EPA Contract Laboratory Program Statement of Work for Organic Analyses* (EPA 2003a). TAL metal analyses were performed by the Chemtech Consulting Group, which is located in Mountainside, New Jersey, a CLP laboratory, following the *EPA Contract Laboratory Program Statement of Work for Inorganic Analyses* (EPA 2000b).

All data from analyses performed at the CLP laboratories were reviewed and validated by EPA chemists. Data qualifiers were applied as necessary according to the following guidance:

- *EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA 2002b); and
- *EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA 1999).

Copies of the data QA memoranda are included in Appendix E.

4.1 SATISFACTION OF DATA QUALITY OBJECTIVES

The following EPA (2000a) guidance document was used to establish data quality objectives (DQOs) for this IA:

5. ANALYTICAL RESULTS REPORTING AND BACKGROUND SAMPLES

This section describes the reporting and methods applied to analytical results presented in Sections 6, 7, and 8 of this report, and discusses background locations and sample results. Table 3-1 lists all samples collected for laboratory analysis.

5.1 ANALYTICAL RESULTS EVALUATION CRITERIA

Analytical results presented in the summary tables in Sections 6, 7, and 8 show all compounds detected above laboratory detection limits in bold type. Analytical results indicating significant concentrations of contaminants in source samples (Section 6) with respect to background concentrations are shown underlined and in bold type. Similarly, analytical results indicating elevated concentrations of contaminants in target samples (Section 7) with respect to background concentrations are also shown underlined and in bold type. For the purposes of this investigation, significant/elevated concentrations are those concentrations that are:

- Equal to or greater than the sample's Contract Required Detection Limit/Contract Required Quantitation Limit (CRDL/CRQL) or the sample quantitation limit (SQL) when a non-CLP laboratory was used; and
- Equal to or greater than the background sample's CRDL/CRQL or SQL when the background concentration is below detection limits; or
- At least three times greater than the background concentration when the background concentration equals or exceeds the detection limits.

Site benchmarks are used for the purpose of characterizing the hazardous substances for the removal assessment (Section 8). Benchmarks were not used when characterizing sources (Section 6) or targets (Section 7) in this report.

The analytical summary tables present all detected compounds, but only those detected analytes at potential sources or in targets meeting the significant/elevated concentration criteria are discussed in the report sources and migration/exposure pathways section. Additionally, only those analytes that exceed benchmarks are discussed in the removal assessment section (Section 8).

5.1.1 Sample Results Reporting

When reporting the analytical results in Sections 6, 7, and 8, the number of analytes/compounds for an analytical suite at a significant/elevated, or exceeding a benchmark are provided. Based on EPA, Region 10 policy, evaluation of aluminum, calcium, iron, magnesium, potassium, and sodium (common earth crust elements) is generally employed only in water mass tracing, which is beyond the scope of this report. For this reason, these elements will not be discussed in this report.

5.2 BACKGROUND SAMPLES

Background samples were collected for each of the naturally occurring media from which IA samples were collected. These media are surface soil, subsurface soil, groundwater, surface water, and sediment. Results for the appropriate background samples are shown in the first column of the analytical results summary tables in Sections 6 and 7 for comparison against source or target results.

5.2.1 Background Surface Soil

5.2.1.1 Sample Locations

One off-site background surface soil sample (BG04SS) was collected from native soil approximately 0.2 mile south of the site (Figure 3-1). The background soil types matched those of samples collected on site.

5.2.1.2 Sample Results

Background surface soil results are presented in Table 6-1. One pesticide, 4,4'-dichlorodiphenyltrichloroethane (DDT), was detected in the background surface soil sample. A total of nine TAL metals (barium, cadmium, chromium, copper, lead, manganese, nickel, vanadium, and zinc) were detected in the background surface soil sample. No SVOCs or VOCs were detected in the background surface soil sample.

5.2.2 Background Subsurface Soil

5.2.2.1 Sample Locations

One subsurface soil sample (BG04SB04) was collected. Sample BG04SB04 was collected from a location co-located with BG04SS, at a depth of 0 to 4 feet bgs. The background soil types matched those of samples collected on site.

5.2.2.2 Sample Results

Background subsurface soil sample results are presented in Table 6-2. Eight TAL metals (barium, chromium, copper, lead, manganese, nickel, vanadium, and zinc) were detected in the background subsurface soil sample. No pesticides/PCBs, SVOCs, or VOCs were detected in the background subsurface soil sample.

5.2.3 Groundwater

5.2.3.1 Sample Location

One background groundwater sample (BG01GW) was collected from Bremerton City monitoring well BR-9 which is located approximately 0.8 mile northwest of the site. The location of groundwater sample BG01GW is assumed to be hydraulically crossgradient from the site. The water level at well BR-9 was 53.30 feet from the top of the casing on monitoring well BR-9.

5.2.3.2 Sample Results

Background groundwater sample results are presented in Table 7-2. Two TAL metals (manganese and zinc) were detected in the background groundwater sample. No pesticides/PCBs, SVOCs, or VOCs were detected in the background groundwater sample.

5.2.4 Background Surface Water

5.2.4.1 Sample Locations

One background surface water sample (BG02SW) was collected near the headwaters of Gorst Creek, approximately 0.3 mile south of the site. The sample was co-located with the background sediment sample (BG03SD).

5.2.4.2 Sample Results

Background surface water sample results are presented in Table 7-4. One TAL metal, zinc, was detected in the background surface water sample. No pesticides/PCBs, SVOCs, or VOCs were detected in the background surface water sample.

5.2.5 Background Sediment

5.2.5.1 Sample Locations

One background sediment sample (BG03SD) was collected from near the headwaters of Gorst Creek, approximately 0.3 mile south of the site. The sediment sample was co-located with the background surface water sample (BG02SW). The background sediment sample was similar in composition to the downstream Gorst Creek sediment samples collected.

5.2.5.2 Sample Results

Background sediment sample results are presented in Table 7-5. One pesticide/PCB, 4,4-DDT, was detected in the background sediment sample. Nine TAL metals (arsenic, barium, chromium, copper, lead, manganese, nickel, vanadium, and zinc) were detected in the background sediment sample. No SVOCs or VOCs were detected in the background sediment sample.

6. POTENTIAL SOURCES

This section describes sample locations and analytical results of IA samples obtained from potential sources. The sampling locations, sampling rationale, and analytical results are summarized in the following sections. Laboratory data sheets of analytical results for all samples are provided in Appendix E.

6.1 LANDFILL

The closed landfill contains approximately 150,000 cubic yards of waste. Prior to commencing field activities, a mobile camera was deployed into the culvert underneath the closed landfill. The camera was used to identify potential causes for the backup on the southeast side of the landfill. Based on the video of the remote camera approximately 450 feet upgradient of the culvert outflow, the culvert appeared to be crushed and a limited amount of water was passing through the culvert. The landfill is not contained in order to control potential leaching into the groundwater or capped to prevent migration of contamination via overland flow from floods, potential exposure to contaminated soils, or potential release to the air.

6.1.1 Surface Soils

6.1.1.1 Sample Locations

A total of six surface soil samples (LF01SS, LF02SS, LF03SS, LF04SS, LF05SS, and LF06SS) were collected from the closed landfill area (Figure 3-1). The surface soil sample locations were selected in order to obtain a representative sampling of the surface soils at the landfill. Samples LF01SS, LF02SS, LF03SS, LF05SS, and LF06SS appeared to be a light brown, moist, clayey silt. Sample LF04SS consisted of moderate brown, dry poorly-graded sand with roots and vegetative matter. No odor or staining was noted during the collection of the surface soil samples. The six surface soil samples were co-located with the subsurface soil borehole locations (LF01SB through LF06SB).

Additionally, the SQAP allowed for the collection of up to six surface soil samples from the slope failure area on the north side of the landfill. Due to extensive blackberry brambles which limited access to the slope area, these surface soil samples were not collected.

6.1.1.2 Sample Results

Sample results are summarized in Table 6-1. Figure 6-1 depicts the analytes detected at significant concentrations with respect to background concentrations that were also detected at elevated concentrations with respect to background concentrations in target samples.

A total of eight pesticides/PCBs were detected at significant concentrations with respect to background, ranging from an estimated concentration of 4.6 micrograms per kilogram (µg/kg; alpha-chlordane) to an estimated concentration of 88 µg/kg (Aroclor-1254). A total of four TAL metals were detected at significant concentrations with respect to background, ranging from 0.62 milligrams per kilogram (mg/kg; mercury) to 278 mg/kg (lead). No SVOCs or VOCs were detected at significant concentrations with respect to background in the surface soil samples.

Of the analytes detected at significant concentrations, only arsenic was detected in all six surface soil samples.

6.1.2 Subsurface Soils

6.1.2.1 Sample Locations

Six borehole locations were selected on the closed landfill to characterize the extent of contamination. Samples were collected from 4-foot intervals to 20 feet bgs, or until groundwater or resistance to recovery was encountered. These borehole locations were co-located with the surface soil sample locations. No staining or odor were noted on Boreholes LF01 through LF05. At Borehole LF06 from the 4- to 8-foot interval, staining and a creosote-like odor were noted in the wood fragments within the sample material. This odor and staining continued into the 8 to 12 foot interval as well as the 12 to 16 foot interval. At approximately 13 feet, the sample material became saturated and water was encountered at 16 feet.

6.1.2.2 Sample Results

Sample results are presented in Table 6-2. Figure 6-2 depicts the analytes that were detected at significant concentrations with respect to background in all six of the borehole locations and were detected at elevated concentrations in the target samples. The highest concentration from each borehole location is presented in Figure 6-2.

A total of 15 pesticides/PCBs were detected at significant concentrations with respect to background in the subsurface soil samples ranging from an estimated concentration of 2.5 µg/kg (alpha-chlordane) to an estimated concentration of 610 µg/kg (dieldrin). A total of nine TAL metals

were detected at significant concentrations with respect to background in the subsurface soil samples, ranging from 0.13 mg/kg (mercury) to 1,410 mg/kg (lead). A total of 13 SVOCs were detected at significant concentrations with respect to background in the subsurface soil samples ranging from 450 µg/kg (bis[2-ethylhexyl]phthalate) to 95,000 µg/kg (naphthalene). A total of five VOCs were detected at significant concentrations with respect to background in the subsurface soil samples ranging from an estimated concentration of 11 µg/kg (carbon disulfide) to an estimated concentration of 1,400 µg/kg (total xylenes).

Of the pesticides/PCBs detected at significant concentrations in the subsurface soil samples, four analytes were detected in all six borehole locations, 4,4'-dichlorodiphenyldichloroethylene (DDE); 4,4'-DDT; alpha-chlordane; and gamma-chlordane. Of the TAL metals, three analytes were detected in all six borehole locations, arsenic, lead, and zinc. No SVOCs or VOCs were detected in all six of the borehole locations. Only arsenic was detected at significant concentrations in all surface soil samples and in all six borehole locations.

Table 6-1

SURFACE SOIL SAMPLES ANALYTICAL RESULTS SUMMARY
GORST CREEK - BREMERTON AUTO WRECKING LANDFILL
PORT ORCHARD, WASHINGTON

EPA Sample ID	03464443	03464400	03464404	03464409	03464415	03464432	03464438
CLP Organic ID	J27B1	J2768	J2772	J2777	J2783	J27A0	J27A6
CLP Inorganic ID	MJ27B1	MJ2768	MJ2772	MJ2777	MJ2783	MJ27A0	MJ27A6
Station Location	BG04SS	LF01SS	LF02SS	LF03SS	LF04SS	LF05SS	LF06SS
Sample Depth (inches bgs)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6
Sample Description	Background	Borehole 1	Borehole 2	Borehole 3	Borehole 4	Borehole 5	Borehole 6
Pesticides/Polychlorinated Biphenyls (ug/kg)							
4,4'-DDD	3.5 U	4.2 U	4.1 U	4.1 U	18 JH	3.9 U	3.8 U
4,4'-DDT	16	4.2 U	4.1 U	20 JH	54 JH	4.9	15 JH
Alpha-Chlordane	1.8 U	2.2 U	2.1 U	4.6 JH	30 JH	2.0 U	2.3 U
Aroclor-1242	35 U	42 U	41 U	50 JK	40 U	39 U	38 U
Aroclor-1248	35 U	42 U	69	41 U	40 U	39 U	38 U
Aroclor-1254	35 U	42 U	41 U	50 JK	40 U	39 U	88 JH
Endrin Aldehyde	3.5 U	4.2 U	4.1 U	4.1 U	4.0 U	3.9 U	4.7 JH
Gamma-Chlordane	1.8 U	2.2 U	2.1 U	5.2 JH	33 JH	2.0 U	2.0 U
Target Analyte List Metals (mg/kg)							
Aluminum	13700	14600	12200	12400	12400	6700	5850
Arsenic	1.8 JB (2.1 SQL)	5.9	3.5	4.0	7.6	2.6	3.3
Barium	58.1	96.7	71.0	82.5	139	48.0 JB	29.7 JB
Cadmium	2.0	0.18 U	0.31 JB	0.40 JB	1.6	0.43 JB	0.21 JB
Calcium	2730	4600	4390	6030	4990	4440	2480
Chromium	25.6 JH	33.8 JH	31.9 JH	35.3 JH	31.1 JH	17.7	13.7
Copper	29.4	23.4	20.0	26.2	44.8	26.5 JH	14.8 JH
Iron	17200	22700	17300	18500	17100	9290	8370
Lead	81.8	9.6	32.0	121	278	79.9	16.2
Magnesium	3840	5810	5020	5110	4690	2910	2530
Manganese	304 JH	579 JH	283 JH	297 JH	291 JH	167 JL	134 JL
Mercury	0.11 U	0.12 U	0.12 U	0.12 U	0.62	0.11 U	0.19
Nickel	30.3 JL	39.4 JL	35.1 JL	37.9 JL	35.8 JL	20.5	19.4
Vanadium	39.3	52.1	45.4	43.8	43.7	20.4	18.8
Zinc	84.8	58.1	90.2	189	256	88.5	60.3

Note: Bold type indicates the sample result is above the instrument detection limit.
Underline type indicates the sample result is significant as defined in Section 5.

Key:

B = The reported concentration is between the instrument detection limit and the contract required detection limit.
bgs = Below ground surface.
CLP = Contract Laboratory Program.
DDD = Dichlorodiphenyldichloroethane.
DDT = Dichlorodiphenyltrichloroethane.
EPA = United States Environmental Protection Agency.
H = High bias.
ID = Identification.
J = The analyte was positivley identified. The associated numerical result is an estimate.
K = Unknown bias.
L = Low bias.
µg/kg = Micrograms per kilogram.
mg/kg = Milligramps per kilogram.
SQL = Sample quantitation limit.
U = The analyte was not detected at or above the reported result.

Table 6-1

SURFACE SOIL SAMPLES ANALYTICAL RESULTS SUMMARY
GORST CREEK - BREMERTON AUTO WRECKING LANDFILL
PORT ORCHARD, WASHINGTON

EPA Sample ID	03464443	03464400	03464404	03464409	03464415	03464432	03464438
CLP Organic ID	J27B1	J2768	J2772	J2777	J2783	J27A0	J27A6
CLP Inorganic ID	MJ27B1	MJ2768	MJ2772	MJ2777	MJ2783	MJ27A0	MJ27A6
Station Location	BG04SS	LF01SS	LF02SS	LF03SS	LF04SS	LF05SS	LF06SS
Sample Depth (inches bgs)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6
Sample Description	Background	Borehole 1	Borehole 2	Borehole 3	Borehole 4	Borehole 5	Borehole 6
Pesticides/Polychlorinated Biphenyls (µg/kg)							
4,4'-DDD	3.5 U	4.2 U	4.1 U	4.1 U	18 JH	3.9 U	3.8 U
4,4'-DDT	16	4.2 U	4.1 U	20 JH	54 JH	4.9	15 JH
Alpha-Chlordane	1.8 U	2.2 U	2.1 U	4.6 JH	30 JH	2.0 U	2.3 U
Aroclor-1242	35 U	42 U	41 U	50 JK	40 U	39 U	38 U
Aroclor-1248	35 U	42 U	69	41 U	40 U	39 U	38 U
Aroclor-1254	35 U	42 U	41 U	50 JK	40 U	39 U	88 JH
Endrin Aldehyde	3.5 U	4.2 U	4.1 U	4.1 U	4.0 U	3.9 U	4.7 JH
Gamma-Chlordane	1.8 U	2.2 U	2.1 U	5.2 JH	33 JH	2.0 U	2.0 U
Target Analyte List Metals (mg/kg)							
Aluminum	13700	14600	12200	12400	12400	6700	5850
Arsenic	1.8 JB (2.1 SQL)	5.9	3.5	4.0	7.6	2.6	3.3
Barium	58.1	96.7	71.0	82.5	139	48.0 JB	29.7 JB
Cadmium	2.0	0.18 U	0.31 JB	0.40 JB	1.6	0.43 JB	0.21 JB
Calcium	2730	4600	4390	6030	4990	4440	2480
Chromium	25.6 JH	33.8 JH	31.9 JH	35.3 JH	31.1 JH	17.7	13.7
Copper	29.4	23.4	20.0	26.2	44.8	26.5 JH	14.8 JH
Iron	17200	22700	17300	18500	17100	9290	8370
Lead	81.8	9.6	32.0	121	278	79.9	16.2
Magnesium	3840	5810	5020	5110	4690	2910	2530
Manganese	304 JH	579 JH	283 JH	297 JH	291 JH	167 JL	134 JL
Mercury	0.11 U	0.12 U	0.12 U	0.12 U	0.62	0.11 U	0.19
Nickel	30.3 JL	39.4 JL	35.1 JL	37.9 JL	35.8 JL	20.5	19.4
Vanadium	39.3	52.1	45.4	43.8	43.7	20.4	18.8
Zinc	84.8	58.1	90.2	189	256	88.5	60.3

Note: Bold type indicates the sample result is above the instrument detection limit.
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DDD = Dichlorodiphenyldichloroethane.
DDT = Dichlorodiphenyltrichloroethane.
EPA = United States Environmental Protection Agency.
H = High bias.
ID = Identification.
J = The analyte was positivley identified. The associated numerical result is an estimate.
K = Unknown bias.
L = Low bias.
µg/kg = Micrograms per kilogram.
mg/kg = Milligramps per kilogram.
SQL = Sample quantitation limit.
U = The analyte was not detected at or above the reported result.

Table 6-2

SUBSURFACE SOIL SAMPLES ANALYTICAL RESULTS SUMMARY
GORST CREEK - BREMERTON AUTO WRECKING LANDFILL
PORT ORCHARD, WASHINGTON

EPA Sample ID	03464444	03464401	03464402	03464403	03464405	03464406	03464407	03464408	03464410	03464411	03464412	03464413	03464414	03464416	03464417	03464418	03464419	03464420
CLP Organic ID	J27B2	J2769	J2770	J2771	J2773	J2774	J2775	J2776	J2778	J2779	J2780	J2781	J2782	J2784	J2785	J2786	J2787	J2788
CLP Inorganic ID	MJ27B2	MJ2769	MJ2770	MJ2771	MJ2773	MJ2774	MJ2775	MJ2776	MJ2778	MJ2779	MJ2780	MJ2781	MJ2782	MJ2784	MJ2785	NA	MJ2787	NA
Station Location	BG04SB04	LF01SB04	LF01SB08	LF01SB12	LF02SB04	LF02SB08	LF02SB12	LF02SB16	LF03SB04	LF03SB08	LF03SB12	LF03SB16	LF03SB20	LF04SB04	LF04SB08	LF04SB12	LF04SB16	LF04SB20
Sample Depth (feet bgs)	0 - 4	0 - 4	4 - 8	8 - 12	0 - 4	4 - 8	8 - 12	12 - 16	0 - 4	4 - 8	8 - 12	12 - 16	16 - 20	0 - 4	4 - 8	8 - 12	12 - 16	16 - 20
Description	Background	Borehole 1			Borehole 2				Borehole 3					Borehole 4				
4,4'-DDD	3.5 U	4.8 U	3.8 U	29 JH	4.3 U	19 U	23 JH	12 U	7.3 JH	3.7 U	3.7 U	35	4.3 U	7.6 JH	4.1 U	64 JH	29 JH	38 JH
4,4'-DDE	3.5 U	3.8 U	3.8 U	8.9 JH	4.3 U	9.9	7.5	5.5 JH	3.7 U	11 U	6.9 JH	7.6 U	19 JH	10 JH	4.1 U	26 U	8.4 U	4.4 U
4,4'-DDT	3.5 U	43 U	6.9	11 JH	4.3 U	43	24 JH	27 JH	13 JH	12 JH	26 JH	13 JH	29 JH	12 JH	10 JH	35 JH	13 JH	19 JH
Aldrin	1.8 U	2.0 U	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	1.9 U	1.9 U	1.9 U	1.9 U	2.0 U	2.2 U	1.9 U	2.1 U	2.0 U	2.0 U	2.1 U
alpha-Chlordane	1.8 U	2.0 U	2.0 U	5.5 JH	2.2 U	28 U	9.7 JH	4.1 U	6.1 JH	1.9 U	2.5 JH	13 JH	59 JH	9.7	2.6 JH	37 JH	6.1 JH	5.3 JH
Aroclor-1242	35 U	38 U	38 U	120	43 U	39 U	340 JK	100	37 U	92 JH	37 U	38 U	110	36 U	41 U	250 JK	100	120
Aroclor-1254	35 U	38 U	38 U	90 JH	43 U	39 U	140 JH	170	37 U	88	140	65	280	62 JH	41 U	240 JK	99	210
Aroclor-1260	35 U	38 U	38 U	45 JH	43 U	39 U	77 JH	120	37 U	37 U	53 JH	82	43 U	36 U	41 U	40 UJK	38 U	40 U
Beta-BHC	1.8 U	2.0 U	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	1.9 U	1.9 U	1.9 U	1.9 U	2.0 U	2.3 U	1.9 U	2.1 U	2.0 U	2.0 U	2.1 U
Dieldrin	3.5 U	3.8 U	3.8 U	3.9 U	4.3 U	11 U	9.5 U	5.1 U	3.7 U	3.7 U	5.2 U	5 U	14 U	3.6 U	6.9 JH	8.8 U	6.2 U	7.8 U
Endrin	3.5 U	3.8 U	3.8 U	3.8 U	4.3 U	3.9 U	3.8 U	3.7 U	3.7 U	3.7 U	3.7 U	3.8 U	4.3 U	3.6 U	4.1 U	4 U	3.8 U	4.0 U
Endrin ketone	3.5 U	3.8 U	3.8 U	3.8 U	4.3 U	11	3.8 U	3.7 U	3.7 U	3.7 U	3.7 U	3.8 U	4.3 U	3.6 U	4.1 U	24 JX	3.8 U	4.0 U
gamma-Chlordane	1.8 U	10	2.0 U	7.2 JH	2.2 U	31	13 JH	11 JH	6.9 JH	1.9 U	1.9 U	17 JH	67 JH	11 JH	3.7 JH	49 JH	8.7 JH	2.1 U
Heptachlor	1.8 U	2.0 U	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	1.9 U	1.9 U	1.9 U	1.9 U	2.0 U	2.2 U	1.9 U	2.1 U	6 U	2.0 U	2.3 U
Heptachlor epoxide	1.8 U	24	2.0 U	2.0 U	2.2 U	4.9	2.0 U	3.0 U	2.0 U	5.0 U	1.9 U	2.1 U	9.3 U	2.1 U	2.1 U	11 U	2.0 U	7.4 U
Aluminum	11100	12500	9710	9650	12300	10400	12500	14800	10300	13700	11400	12400	12900	11500	9850	NA	11000	NA
Arsenic	1.3 U	6.8	16.0	3.2	4.1	1.8 JB	2.8	2.6	9.5	6.6	5.7	1.3 U	5.7	5.7	9.8	NA	14.2	NA
Barium	69.4	118	189	63.7	80.5	125	220	144	95.8	227	76.4	110	137	129	102	NA	127	NA
Cadmium	0.15 U	0.59 JB	0.24 JB	0.67 JB	0.41 JB	0.51 JB	0.46 JB	0.40 JB	0.16 U	0.33 JB	0.28 JB	0.20 JB	0.46 JB	0.20 JB	0.23 JB	NA	1.2	NA
Calcium	860 JB	9250	18300	8620	4500	4590	3860	4230	26400	25300	7980	3120	10100	15300	18300	NA	25500	NA
Chromium	14.4	26.2 JH	20.2 JH	28.0 JH	31.8 JH	21.2 JH	23.0 JH	24.5 JH	20.7 JH	23.5 JH	20.5 JH	22.3 JH	30.6 JH	21.6 JH	21.6 JH	NA	23.7 JH	NA
Cobalt	7.5 JB (SQL 10.9)	12.0	8.3 JB	8.3 JB	10.2 JB	8.4 JB	9.1 JB	9.9 JB	7.1 JB	8.3 JB	8.6 JB	9.7 JB	9.8 JB	7.9 JB	7.8 JB	NA	8.8 JB	NA
Copper	11.8 JH	26.1	44.2	43.8	28.6	19.6	24.2	21.1	23.4	25.5	19.3	21.7	31.8	21.0	23.2	NA	39.8	NA
Iron	8990	15900	14100	16100	17100	14000	16200	17100	12200	15200	14800	16700	23400	13700	13100	NA	24100	NA
Lead	2.5	113	255	57.4	48.5	202	141	167	180	1100	185	68.9	149	486	289	NA	96.4	NA
Magnesium	2920	4330	4100	4190	5220	4050	4010	4080	4230	4410	3930	3990	4020	4240	3480	NA	3720	NA
Manganese	199 JL	357 JH	283 JH	314 JH	285 JH	183 JH	243 JH	259 JH	274 JH	262 JH	214 JH	228 JH	299 JH	255 JH	245 JH	NA	265 JH	NA
Mercury	0.11U	0.26 U	0.28 U	0.12 U	0.27 U	0.20 U	1.1	0.22 U	0.50	0.30 U	0.11 U	0.13	0.19 U	0.22 U	0.32 U	NA	0.16 U	NA
Nickel	24.6	32.3 JL	29.2 JL	34.1 JL	37.2 JL	34.2 JL	34.4 JL	40.3 JL	27.6 JL	32.5 JL	32.0 JL	33.7 JL	33.8 JL	30.6 JL	29.2 JL	NA	33.6 JL	NA
Silver	0.31 UJL	0.32 UJL	0.32 UJL	0.52 JB	0.35 UJL	0.35 UJL	0.32 UJL	0.31 UJL	0.32 UJL	0.32 UJL	0.32 UJL	5.0 JL	0.35 UJL	0.32 UJL	0.33 UJL	NA	0.34 UJL	NA
Vanadium	24.0	36.6	29.6	36.2	43.8	30.2	35.7	37.9	29.5	35.9	33.4	36.4	33.1	34.5	28.0	NA	29.1	NA
Zinc	22.0	112	161	134	131	267	215	279	110	204	122	98.8	185	137	144	NA	982	NA
1,1'-Biphenyl	350 U	380 U	380 U	NA	430 U	2000 U	380 U	370 U	370 U	380 U	380 U	380 U	430 U	360 U	410 U	NA	380 U	NA
2-Methylnaphthalene	350 U	380 U	380 U	NA	430 U	2000 U	73 JQ	370 U	370 U	73 JQ	380 U	380 U	430 U	360 U	410 U	NA	380 U	NA
Acenaphthene	350 U	380 U	380 U	NA	430 U	2000 U	380 U	370 U	370 U	110 JQ	380 U	380 U	430 U	360 U	410 U	NA	380 U	NA
Anthracene	350 U	380 U	380 U	NA	430 U	2000 U	380 U	370 U	52 JQ	180 JQ	380 U	380 U	430 U	52 JQ	410 U	NA	380 U	NA
Benzaldehyde	350 U	16000	380 U	NA	430 U	2000 U	380 U	370 U	370 U	380 U	380 U	380 U	430 U	360 U	410 U	NA	380 U	NA
Bis(2-ethylhexyl)phthalate	350 U	15000	55 JQ	NA	130 JQ	4200	360 JQ	460	180 JQ	190 JQ	340 JQ	6000	740	450	410 U	NA	930	NA
Butylbenzylphthalate	350 U	4400	380 U	NA	190 JQ	2000 U	190 JQ	93 JQ	170 JQ	380 U	380 U	920	430 U	45 JQ	53 JQ	NA	6100	NA
Dibenzofuran	350 U	380 U	380 U	NA	430 U	2000 U	380 U	370 U	370 U	47 JQ	380 U	380 U	430 U	360 U	410 U	NA	380 U	NA
Fluoranthene	350 U	73 JQ	120 JQ	NA	430 U	310 JQ	57 JQ	280 JQ	270 JQ	640	62 JQ	380 U	430 U	260 JQ	92 JQ	NA	62 JQ	NA
Fluorene	350 U	380 U	380 U	NA	430 U	2000 U	380 U	370 U	370 U	120 JQ	380 U	380 U	430 U	360 U	410 U	NA	380 U	NA
Naphthalene	350 U	380 U	380 U	NA	430 U	2000 U	170 JQ	53 JQ	370 U	150 JQ	380 U	380 U	430 U	360 U	410 U	NA	380 U	NA
Phenanthrene	350 U	53 JQ	83 JQ	NA	430 U	2000 U	79 JQ	120 JQ	220 JQ	950	38 JQ	380 U	72 JQ	280 JQ	68 JQ	NA	65 JQ	NA
Pyrene	150 JQ	92 JQ	130 JQ	NA	72 JQ	360 JQ	61 JQ	230 JQ	300 JQ	660	75 JQ	380 U	68 JQ	270 JQ	110 JQ	NA	95 JQ	NA
2-Butanone	11 U	NA	12 U	6 JQ	13 U	12 U	13	8 JQ	11 U	11 U	11 U	11 JQ	13 U	11 U	12 U	6 JQ	7 JQ	12 U
Acetone	11 U	NA	12 U	44	13 U	12 U	27	67	11 U	34 U	3 JQ	61	5 JQ	11 U	12 U	46	42	43 JQ
Carbon Disulfide	11 U	NA	12 U	11 JQ	13 U	12 U	2 JQ	11 U	11 U	5 JQ	11 U	2 JQ	11 JQ	11 U	12 U	10 JQ	3 JQ	11 JK
Methylcyclohexane	11 U	NA	12 U	11 U	13 U	12 U	11 U	11 U	11 U	11 U	11 U	16	9 JQ	11 U	12 U	12 U	12 U	12 U
Total Xylenes	11 U	NA	12 U	11 U	13 U	12 U	11 U	11 U	11 U	11 U	11 U	17	4 JQ	11 U	12 U	12 U	1400 JL	95

Table 6-2

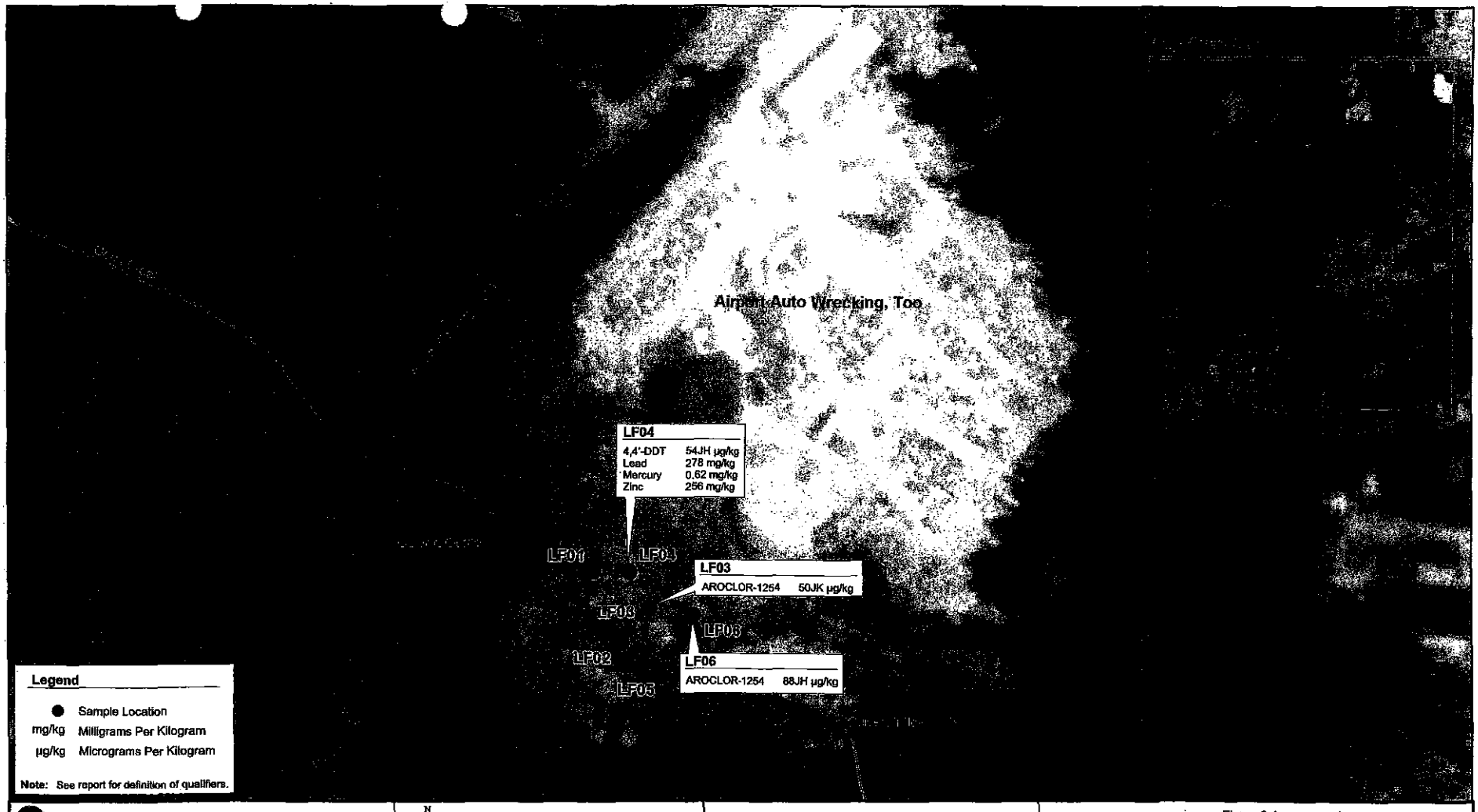
SURFACE SOIL SAMPLES ANALYTICAL RESULTS SUMMARY
GORST CREEK - BREMERTON AUTO WRECKING LANDFILL
PORT ORCHARD, WASHINGTON

EPA Sample ID	03464444	03464433	03464434	03464435	03464436	03464437	03464439	03464440	03464441	03464442
CLP Organic ID	J27B2	J27A1	J27A2	J27A3	J27A4	J27A5	J27A7	J27A8	J27A9	J27B0
CLP Inorganic ID	MJ27B2	MJ27A1	MJ27A2	MJ27A3	MJ27A4	MJ27A5	MJ27A7	MJ27A8	MJ27A9	NA
Station Location	BG04SB04	LF05SB04	LF05SB08	LF05SB12	LF05SB16	LF05SB20	LF06SB04	LF06SB08	LF06SB12	LF06SB16
Sample Depth (feet bgs)	0 - 4	0 - 4	4 - 8	8 - 12	12 - 16	16 - 20	0 - 4	4 - 8	8 - 12	12 - 16
Description	Background	Borehole 5					Borehole 6			
4,4'-DDD	3.5 U	3.8 U	3.6 U	3.6 U	3.5 U	3.7 U	3.9 U	3.9 U	74 JH	64 JH
4,4'-DDE	3.5 U	3.8 U	4.6 JH	3.6 U	3.5 U	3.7 U	5.6 U	3.9 U	48	20 JH
4,4'-DDT	3.5 U	10	7.1 JH	3.6 U	3.5 U	3.7 U	16 JH	33 JH	77 JH	19 JH
Aldrin	1.8 U	2.0 U	1.9 U	1.8 U	1.8 U	1.9 U	2.0 U	2.0 U	2.0 U	29 JH
alpha-Chlordane	1.8 U	4.8 JH	21 JH	1.8 U	1.8 U	1.9 U	25 JH	6.9	20 JH	6.3 JH
Aroclor-1242	35 U	38 U	36 U	36 U	35 U	37 U	39 U	39 U	38 U	430 JH
Aroclor-1254	35 U	38 U	36 U	36 U	35 U	37 U	39 U	39 U	190 JH	370 JH
Aroclor-1260	35 U	38 U	36 U	36 U	35 U	37 U	39 U	39 U	38 U	52 U
Beta-BHC	1.8 U	2.0 U	1.9 U	1.8 U	1.8 U	1.9 U	15 U	2.0 U	19	2.7 U
Dieldrin	3.5 U	3.8 U	3.6 U	3.6 U	3.5 U	3.7 U	5.6 U	3.9 U	160 JH	610 JH
Endrin	3.5 U	3.8 U	3.6 U	3.6 U	3.5 U	3.7 U	3.9 U	6.2 JH	7.1 U	5.2 U
Endrin ketone	3.5 U	3.8 U	3.6 U	3.6 U	3.5 U	3.7 U	6.2 JH	11 JH	3.8 U	5.2 U
gamma-Chlordane	1.8 U	5.1	22 JH	1.8 U	1.8 U	1.9 U	24 JH	6.4	23 JH	9.5 U
Heptachlor	1.8 U	2.0 U	1.9 U	1.8 U	1.8 U	1.9 U	2.0 U	2.0 U	4.5 JH	8.0 U
Heptachlor epoxide	1.8 U	2.0 U	3.8 JH	1.8 U	1.8 U	1.9 U	2.0 U	2.7 JH	2.0 U	2.7 U
Aluminum	11100	7510	9840	9190	7830	8150	8060	7370	9270	NA
Arsenic	1.3 U	5.8	24.2	1.2 U	1.2 U	1.3 U	8.3	4.2	6.8	NA
Barium	69.4	72.6	79.0	52.6	46.7	52.1	266	168	180	NA
Cadmium	0.15 U	0.20 JB	0.16 U	0.15 U	0.15 U	0.15 U	0.77 JB	0.62 JB	1.4	NA
Calcium	860 JB	5350	28700	2250	2180	2090	13200	9860	27900	NA
Chromium	14.4	19.9	21.4	19.9	15.7	15.1	25.9	28.0	51.5	NA
Cobalt	7.5 JB (SQL 10.9)	8.0 JB	9.1 JB	7.6 JB	6.9 JB	7.2 JB	6.7 JB	6.8 JB	9.0 JB	NA
Copper	11.8 JH	33.3 JH	27.9 JH	11.9 JH	11.8 JH	11.2 JH	61.3 JH	112 JH	43.0 JH	NA
Iron	8990	17700	13800	10400	10000	9150	12100	12200	25900	NA
Lead	2.5	94.4	98.2	2.7	2.4	2.5	1418	446	800	NA
Magnesium	2920	3470	3300	3290	2900	3100	2660	2960	3400	NA
Manganese	199 JL	236 JL	182 JL	112 JL	132 JL	142 JL	223 JL	195 JL	424 JL	NA
Mercury	0.11U	0.12 U	0.11 U	0.11 U	0.10 U	0.11 U	0.36 U	0.52	1.1	NA
Nickel	24.6	25.9	25.0	29.3	24.8	24.9	22.5	25.8	34.5	NA
Silver	0.31 UJL	0.33 UJL	0.31 UJL	0.30 UJL	0.29 UJL	0.31 UJL	0.34 UJL	0.32 UJL	0.37 UJL	NA
Vanadium	24.0	27.9	24.3	26.0	24.8	20.0	25.9	23.7	30.2	NA
Zinc	22.0	176	209	26.1	22.9	22.8	470	278	1090	NA
1,1' Biphenyl	350 U	1900 U	360 U	360 U	350 U	370 U	780 JQ	5900	1800 JQ	5200 U
2-Methylnaphthalene	350 U	1900 U	360 U	360 U	350 U	370 U	560 JQ	18000	6080	5200 U
Acenaphthene	350 U	1900 U	360 U	360 U	350 U	370 U	3500	26000	8580	5200 U
Anthracene	350 U	1900 U	360 U	360 U	350 U	370 U	3400	17000	5700	5200 U
Benzaldehyde	350 U	1900 U	360 U	360 U	350 U	370 U	2000 U	3900 U	3800 U	5200 U
Bis(2-ethylhexyl)phthalate	350 U	210 JQ	93 JQ	41 JQ	350 U	370 U	240 JQ	480 JQ	10000	49000
Butylbenzylphthalate	350 U	1900 U	190 JQ	360 U	350 U	370 U	2000 U	3900 U	1100 JQ	580 JQ
Dibenzofuran	350 U	1900 U	360 U	360 U	350 U	370 U	3400	22000	7900	5200 U
Fluoranthene	350 U	1900 U	50 JQ	360 U	350 U	370 U	3800	19000	7300	5200 U
Fluorene	350 U	1900 U	360 U	360 U	350 U	370 U	3300	24000	7500	5200 U
Naphthalene	350 U	1900 U	360 U	360 U	350 U	370 U	4800	95000	36000	1700 JQ
Phenanthrene	350 U	1900 U	82 JQ	360 U	350 U	370 U	11000	62000	25000	5200 U
Pyrene	150 JQ	1900 U	460	71 JQ	350 U	370 U	2500	10000	4400	5200 U
2-Butanone	11 U	11 U	11 U	11 U	11 U	11 U	12 U	5 JQ	11 U	NA
Acetone	11 U	3 UJK	4 UJK	4 UJK	11 UJK	11 U	12 U	35	28	NA
Carbon Disulfide	11 U	11 U	11 U	11 U	11 U	11 U	12 U	12 U	11 U	NA
Methycyclohexane	11 U	11 U	11 U	11 U	11 U	11 U	12 U	12 U	11 U	NA
Total Xylenes	11 U	11 U	11 U	11 U	11 U	11 U	12 U	17	11 U	NA

Note: Bold type indicates the sample result is above the instrument detection limit.
Underline type indicates the sample result is significant as defined in Section 5.

Key:

B	= The reported concentration is between the instrument detection limit and the contract required detection limit.
bgs	= Below ground surface.
CLP	= Contract Laboratory Program.
EPA	= United States Environmental Protection Agency.
H	= High bias.
ID	= Identification.
J	= The analyte was positively identified. The associated numerical result is an estimate.
K	= Unknown bias.
L	= Low bias.
µg/kg	= Micrograms per kilogram.
mg/kg	= Milligrams per kilogram.
Q	= The result is estimated because the concentration is below the contract required quantitation limit.
SQL	= Sample quantitation limit.
U	= The analyte was not detected at or above the reported result.



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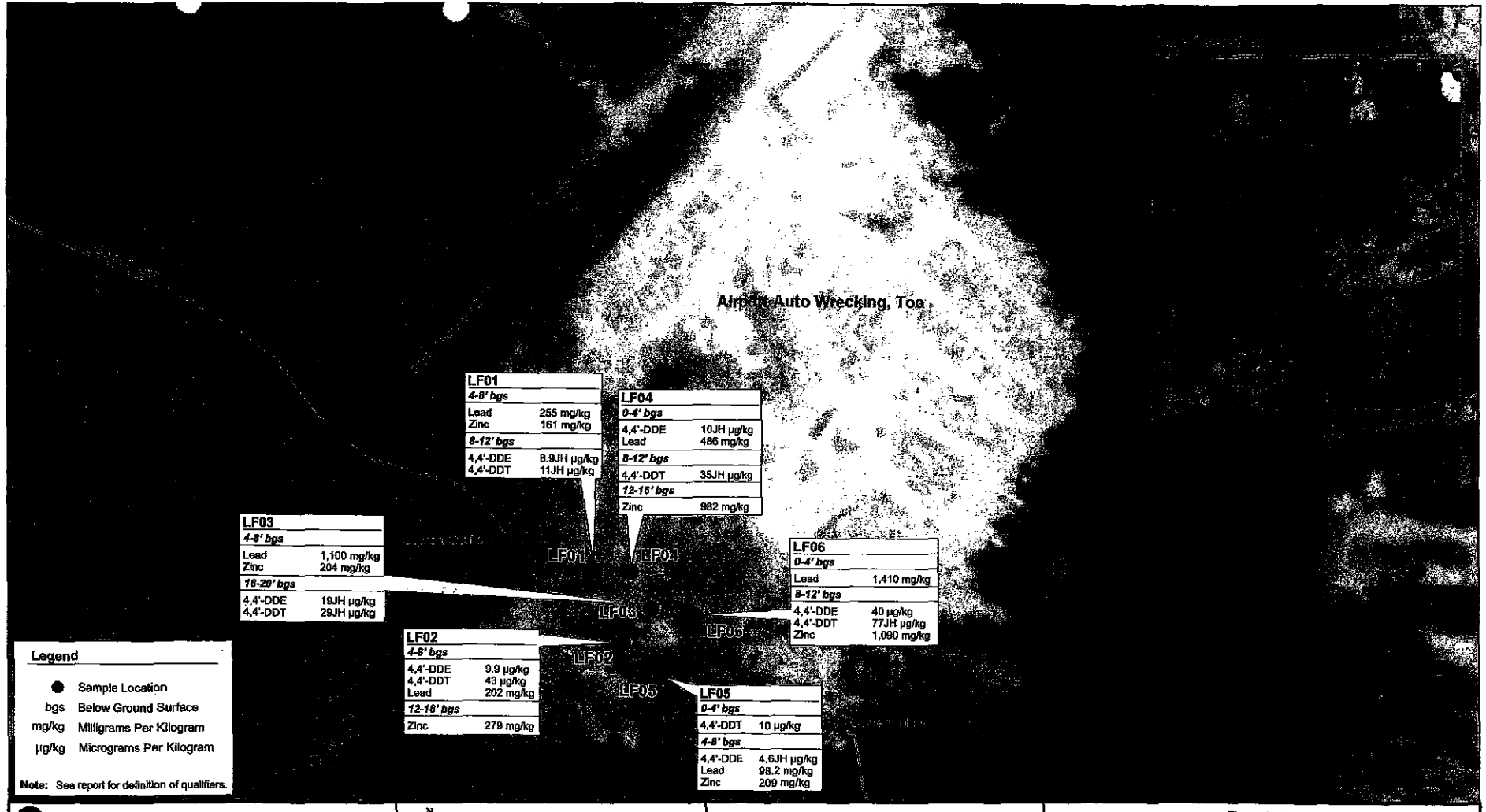
Map Reference: USGS Digital OrthoPhoto Quarter Quadrangle - Bremerton West, July 7, 1994

Gorst Creek - Bremerton Auto Wrecking Landfill
Integrated Assessment
Port Orchard, Washington

Figure 6-1
SURFACE SOIL SAMPLES CONCENTRATION MAP

Date:	Drawn by:	Job Number:
02/12/2004	avh	001281.0291.01IA



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International Specialists in the Environment
Seattle, Washington

Map Reference: USGS Digital OrthoPhoto Quarter Quadrangle - Bremerton West, July 7, 1994

Gorst Creek - Bremerton Auto Wrecking Landfill
Integrated Assessment
Port Orchard, Washington

Figure 6-2
SUBSURFACE SOIL SAMPLES CONCENTRATION MAP

Date:	Drawn by:	Job Number:
02/12/2004	avh	001281.0291.011A

7. MIGRATION/EXPOSURE PATHWAYS AND TARGETS

The following subsections describe migration/exposure pathways and potential targets within the site's range of influence. Analytical data QA forms from laboratory analyses are included in Appendix E. This section discusses the groundwater migration pathway (subsection 7.1), surface water migration pathway (subsection 7.2), soil exposure pathway (subsection 7.3), and air migration pathway (subsection 7.4).

7.1 GROUNDWATER MIGRATION PATHWAY

7.1.1 Pathway Description

The target distance limit (TDL) for the groundwater migration pathway is a 4-mile radius that extends from the sources at the site. Figure 7-1 depicts the groundwater 4-mile TDL. The aquifers located within the 4-mile TDL of the site are defined in two areas, the Gorst Creek Watershed (which includes the Gorst Creek Basin and the Gorst Creek Basin Valley) and the Anderson Creek Watershed. The Anderson Creek Watershed is located approximately 2 miles east of the site. In the Gorst Creek Watershed, four aquifers have been described: the Twin Lakes Aquifer, the Gorst Creek Valley Aquifer, the Upland Aquifer, and the Sea Level Aquifer. In the Anderson Creek Watershed, five aquifers have been described: the Upland Aquifer, the Sea Level Aquifer, the Shallow Artesian Aquifer, the Deep Artesian Aquifer, and the Lower Deep Artesian Aquifer. Not all of these aquifers are used for municipal drinking water purposes but all are available to be used as drinking water and, therefore, are included in this report. (AGI 1996a)

The Gorst Creek Watershed is underlain by three geologic units: Vashon Till, Vashon Recessional Outwash, and Tertiary Bedrock. The Tertiary Bedrock occurs beneath Gold Mountain (which is located approximately 3 miles northwest of the site) north of Gorst Creek Basin and Twin Lakes (which are located approximately 1 mile west of the site). The northern tributaries to Gorst Creek Basin and the Union River (located approximately 2 miles east of the site) drain this area. Vashon Till underlies the upland area south of Gorst Creek Basin, including the town of Sunnyslope, Washington (located approximately 0.5 mile east of the site), and the headwaters of Gorst Creek Basin and its southern tributaries. The Vashon Recessional Outwash occurs along the Gorst Creek Basin Valley and

the Union River - Gorst Creek Basin divide near Twin Lakes. Small exposures of the older Colvos Sand occur along Parish Creek (located approximately 0.5 mile east of the site) and adjacent tributaries. (AGI 1996a)

Available information regarding the aquifers within the 4-mile TDL do not describe the exact depths of all of the aquifers. Where no measurements were available, depths to aquifers were estimated based on the municipal well logs for that aquifer. Available information indicates that groundwater flow for the Gorst Creek Basin is divided (Figure 7-2). The groundwater flow divide is oriented north-south and is located approximately 1 mile west of the site. On the western side of the divide, groundwater flows north-west and then west. On the eastern side of the divide, groundwater flows north, then east, then northeast towards Sinclair Inlet (AGI 1996b). No information for the flow of groundwater is available for the Anderson Creek Watershed.

The Gorst Creek Basin aquifers are described below:

- **Twin Lakes Aquifer.** The Twin Lakes Aquifer is the largest aquifer in the Gorst Creek Basin. The surface expression is the Vashon Recessional Outwash. The Twin Lakes Aquifer is divided into an eastern and western portion by a silt-cored paleo-ridge composed of silt. The aquifer's lower boundary appears to be bedrock along the base of Gold Mountain and the massive silt of the silt sequence. Its upper boundary is a water table, and it generally behaves as an unconfined aquifer. Occasional silt lenses within these units may cause it to behave locally as a confined aquifer. City of Bremerton production wells 15, 17, 18, 19, and 20 are completed in this aquifer. (AGI 1996a)
- **Gorst Creek Valley Aquifer.** The Gorst Creek Valley Aquifer consists of sand, gravel, and domestic wells. It is bounded by the bedrock of Gold and Green Mountains to the north and by the massive silt of the silt sequence in the south. It appears to be separated from the Twin Lakes aquifer by silty sand. This separation is poorly defined by permeability, but water chemistry and aquifer test data confirm its presence. The aquifer's upper boundary is the water table and it behaves as an unconfined aquifer in many places. It may demonstrate confined behavior in areas with silt lenses. The Gorst Creek production well, which is a community well that serves the City of Gorst, is completed in this aquifer. (AGI 1996a)
- **Upland Aquifer.** The Upland Aquifer consists of the sand and gravel units occurring between elevations of 250 and 400 feet above sea level. Locally, these units are separated by either till or silt to form two distinct aquifers. It is confined by the Vashon Till and appears to become thicker to the east. It is exposed at ground surface in the upper reaches of the tributaries to Gorst Creek Basin and underlies the Sunnyslope Upland. The Upland Aquifer discharges into the Twin Lakes Aquifer along the southern margin of the Twin Lakes Divide. None of the City of Bremerton production wells are completed in this aquifer. (AGI 1996a)
- **Sea Level Aquifer:** The Sea Level Aquifer consists of sand and gravel in units that occur between elevations from sea level to more than 200 feet below sea level. Locally,

these units are separated by till and are confined by massive silt. The aquifer is bounded on the north by the bedrock of Gold Mountain and the coarse-grained sediments in the deeper portions of the Gorst Creek Valley and Twin Lakes Aquifers. It may be equivalent to the sea level aquifer encountered in the wells in the Anderson Creek Watershed although its extent to the south, east, and west is unknown. It discharges to the Twin Lakes Aquifer through the buried valley along the upper reaches of Gorst Creek Basin and to the deeper portions of the Gorst Creek Valley Aquifer. One City of Bremerton drinking water well, which serves approximately 2,000 people, is completed in this aquifer. (AGI 1996a)

The surface geology of the Anderson Creek Watershed area is mantled with Vashon Till overlying the Colvos Sand and Kitsap Formation which are exposed in the valleys and in the bluff along Sinclair Inlet. The Colvos Sand includes the Vashon Advance Outwash and a thick basal silt (Lawton Clay), and the underlying Kitsap Formation consists of silty sediments with scattered sand units. The Kitsap Formation is exposed in lower portions of the Anderson Creek Valley around the Bremerton City well field, and the Colvos Sand is exposed higher on the flanking hill slopes. Vashon Till caps the upland portion of the watershed area. (AGI 1996a)

The aquifers in the Anderson Creek Watershed are described as follows:

- **Upland Aquifer:** The Upland Aquifer occurs south of Sinclair Inlet at elevations above 100 feet. It is highly irregular in thickness and varies from less than 50 feet to over 350 feet. It appears to consist of sand- and gravel-filled paleo-valleys connected by sheets of sand and gravel. It is utilized by numerous domestic wells; no City of Bremerton production wells are located within this aquifer. (AGI 1996a)
- **Sea Level Aquifer:** The Sea Level Aquifer occurs south of Sinclair Inlet at elevations between plus 100 feet and minus 250 feet. It varies in thickness from 75 feet to as much as 300 feet. In some places, it may be hydraulically connected with the overlying Upland Aquifer. The Sea Level Aquifer is utilized only by domestic wells, and one City of Bremerton production well (described in Sea Level Aquifer above). (AGI 1996a)
- **Shallow Artesian Aquifer:** The Shallow Artesian Aquifer occurs at elevations of 100 to 250 feet below sea level. The aquifer abruptly terminates against till and silt and probably has a channel shape elongated to the south. The Shallow Artesian Aquifer is 75 to 200 feet thick and underlies the Anderson Creek Well Field where City of Bremerton monitoring wells 1 and 2R, and City of Bremerton production wells 2 and 3 are completed. Production Wells 2 and 3 serve approximately 4,000 people. (AGI 1996a)
- **Deep Artesian Aquifer:** The Deep Artesian Aquifer occurs between elevations of 400 and 600 feet below sea level. Similar to other aquifers, it terminates abruptly against finer-grained sediments and may be channel-shaped. It is at least 200 feet thick and has a transmissivity of approximately 65,000 gallons per day per foot. It may be connected hydraulically with the underlying Lower Deep Artesian Aquifer. City of Bremerton

production wells 7 and 8 are completed in this aquifer and they serve approximately 4,000 people. (AGI 1996a)

- **Lower Deep Artesian Aquifer:** The Lower Deep Artesian Aquifer occurs at depths greater than 650 feet below sea level. The aquifer is at least 150 feet thick and may be hydraulically connected with the overlying Deep Artesian Aquifer. There are no City of Bremerton production wells located in this aquifer. (AGI 1996a)

7.1.2 Targets

One City of Bremerton Water Resource Division monitoring well (BR-11) is located approximately 0.15 mile northeast of the site. The well was installed in 1992 to a depth of 74 feet. The well was sampled on March 26, 1997, seven days after the first flood event and consequent slope failure at the landfill. Cadmium was detected at 42.7 µg/L; copper was detected at 3.0 µg/L; and zinc was detected at 75 µg/L. The maximum contaminant levels (MCLs) for cadmium is 5 µgL, and copper is 1,300 µg/. Zinc does not have an MCL. (Cahall 2003a)

The total number of persons served by City of Bremerton municipal drinking water wells is 22,000 (Cahall 2003b). Three hundred fifty-eight domestic wells are known to exist within a 4-mile radius of the site (Ecology various dates). The START-2 estimates approximately 959 people are served by these wells, based on the average number of persons per household for Kitsap County of 2.68 (DOC 2001). In addition, one privately owned community well, which serves seven people, is located within the 4-mile TDL. The nearest drinking water well to the site is a domestic well located approximately 0.83 mile northeast of the site (Ecology various dates). The total number of drinking water wells located within the 4-mile TDL and the population served per distance ring are provided in Table 7-1.

The site, and all of the municipal wells previously discussed are located within a Safe Drinking Water Act sole source aquifer wellhead protection area (Cahall 2003a). Groundwater is not reported to be used for irrigation of commercial food or commercial forage crops, commercial livestock watering, as an ingredient in commercial food preparation, as a supply for commercial aquaculture, or as a supply for a major or designated water recreation area (Ecology various dates).

7.1.3 Groundwater Sample Locations

One on-site groundwater sample (LF06GW) was collected from approximately 16 feet bgs at Borehole LF06. The sample was collected by lowering Teflon tubing into the Geoprobe cutting shoe, then running the tubing through a peristaltic pump to retrieve the water into prelabeled sampling

containers. The peristaltic pump was allowed to run for approximately 1 hour to develop the groundwater in the boring, at which time the boring quit producing groundwater. The boring was allowed to recharge with groundwater, and then sample LF06GW was collected.

One City of Bremerton monitoring well (BR-11), located hydraulically downgradient of the site, was sampled (MW01GW). The well was sampled by first purging three volumes of water from the well, then measuring water quality parameters using a Horiba U-10 quality meter until parameters had stabilized for three successive readings. After water quality parameters had stabilized, a dedicated Teflon bailer was lowered into the well and the contents were transferred from the bailer to pre-labeled sampling containers.

The SQAP allowed for the sampling of two nearby residential groundwater wells. Access could not be obtained from the homeowners, therefore, no domestic groundwater samples were collected.

7.1.4 Groundwater Sample Results

Sample results are presented in Table 7-2. No pesticides/PCBs were detected at elevated concentrations in the groundwater samples. One TAL metal (mercury) was detected at an estimated elevated concentration of 0.24 JK µg/L, with respect to background from the City of Bremerton monitoring well. The MCL for mercury in groundwater is 2 µg/L. Two SVOCs (bis[2-ethylhexyl]phthalate and naphthalene) were detected at elevated concentrations with respect to background concentrations in the on-site groundwater sample. There are no MCLs for the two SVOCs that were detected at elevated concentrations in the groundwater samples. One VOC (total xylenes) was detected at elevated concentrations with respect to background concentrations in the on-site groundwater sample. The MCL for total xylenes is 10,000 µg/L.

7.2 SURFACE WATER MIGRATION PATHWAY

7.2.1 Pathway Description

The surface water migration pathway TDL begins at the PPE of surface water runoff from the site to a surface waterbody and extends downstream for 15 miles. Figure 7-3 depicts the surface water 15-mile TDL. The edges of the landfill slope towards Gorst Creek at an estimated slop of 30% to 45%. The START-2 identified two PPEs within the 15-mile surface water migration pathway TDL (Figure 2-2). PPE 1 is located at the southeast or upgradient corner of the property in Gorst Creek. Gorst Creek flows under the Gorst Creek - Bremerton Auto Wrecking Landfill for approximately 0.13 mile to PPE 2. PPE 2 is located on the northwest or downgradient side of the landfill in Gorst Creek. From

PPE 2, the creek flows for 3.72 miles to the Puget Sound. The TDL continues within the Puget Sound for the remainder of the 15-mile TDL. The START-2 estimates the flow of Gorst Creek to be less than 10 cubic feet per second.

The mean annual precipitation in Bremerton, Washington, which is located approximately 4 miles northeast of the site, is 51.36 inches (WRCC 2003). The 2-year 24-hour rainfall event for the site is 2.25 inches (NOAA 1973). The START-2 estimates from a topographic map that approximately 7 acres of land drains through the site (USGS 1981). The START-2 assumes the site lies within a 10-year floodplain because the site has flooded two times (in 1997 and 2001) within the past six years. Floodplain maps for the area are available, but due to the evidence of flooding at the site they were not utilized. No sources at the site are contained for a flood event. During a flood event, water from Gorst Creek backs up at PPE 1 and flows in a northwest direction over the landfill for approximately 0.13 mile, then drops over the northwest side of the landfill into Gorst Creek (E & E 2003b).

Surface soils in the area consist of Alderwood very gravelly sandy loam, which is moderately deep, moderately well drained soil formed in glacial till. Typically, the surface of this soil is covered by a thin mat of undecomposed needles and wood fragments. The subsurface layer is brown, very gravelly sandy loam that is 0.5 inch thick. The subsoil is brown very gravelly loam about 21 inches thick. The substratum to a depth of 60 inches or more is grayish brown gravelly sandy loam that is weakly-silica-cemented in the upper part. Depth to the silica-cemented hardpan ranges from 20 to 40 inches. Permeability of this Alderwood soil is moderately rapid above the hardpan and very slow in the hardpan. Runoff is slow, and the hazard of water erosion is slight (USDA 1980).

Surface soils in the area also consist of the Dystric Xerorthents, which are deep, moderately well drained to somewhat excessively drained soils located on sidewalls of river valleys and entrenched streams. These soils formed mainly in glacial till, but some formed in sandy and gravelly outwash. Typically this soil has a mat of undecomposed needles and wood fragments over a surface layer of dark yellowish brown very gravelly sandy loam about 10 inches thick. The upper part of the underlying material is dark brown, brown, and dark yellowish brown very gravelly sandy loam and very gravelly loamy sand. The permeability of these soil is moderate to rapid. Runoff is medium to very rapid. These soils are mainly in tree-covered slump areas. The hazard of erosion is high. (USDA 1980)

7.2.2 Targets

There are no surface water drinking water intakes located within the 15-mile TDL. Surface water is not reported to be used in the irrigation of 5 or more acres of commercial food crops or

commercial forage crops, watering of commercial livestock, as an ingredient in commercial food preparation, or as a major or designated water recreation area.

One tribal fishery is located within the 15-mile TDL. The fishery is located near the mouth of Gorst Creek, on Sinclair Inlet, approximately 3.72 miles downstream of the site. The fishery is supported by a tribal Chinook salmon fish rearing facility, located on Gorst Creek approximately 1 mile upstream of the confluence with Sinclair Inlet. After rearing at the facility, the salmon are released into Sinclair Inlet (Zischke 2003).

Sport fish catch data for 1999 indicates a total of 4,009 salmon were caught in Area 10 (1,762 Chinook; 2,105 Coho; 110 Chum; and 32 Pink; WDFW 2002). Area 10 is comprised of the area of Apple Cove Point - Edwards Point line to the line through the north tip of Vashon Island east - west (WDFW 2002). Approximately 25%of Area 10 lies within the 15-mile TDL. The average wight of Chinook is 22 pounds, the average weight of Coho is 12 pounds, the average weight of Chum is 9 pounds, and the average weight of Pink salmon is 4 pounds (Wydoski and Whitney 1979). Based on these calculations it is estimated that 9,691 pounds of Chinook; 6,315 pounds of Coho; 247.5 pounds of Chum; and 32 pounds of Pink salmon were caught within the 15-mile TDL (Table 7-3). Additionally, a total of 12,745 pounds of clams were harvested in areas within the 15-mile TDL (WDFW 2002). All of the fish and shellfish were harvested from the Puget Sound (from Sinclair Inlet) to the conclusion of the TDL. No fishing occurs in Gorst Creek (Huff 2003b).

Three Federal-listed threatened species are documented to exist within the 15-mile TDL. The Federal-listed threatened Chum salmon (*O. keta*) and Chinook salmon (*O. tshawtscha*), use Gorst Creek for spawning from the headwaters of the creek down to its mouth in Sinclair Inlet (Huff 2003a, WDFW 2002). The Federal-listed threatened bald eagle (*Haliaeetus leucocephalus*) is known to nest within a 4-mile radius of the site (WDFW 2002). The START-2 assumes the eagles are consuming fish that are located within the 15-mile surface water TDL (WDFW 2002).

There are 2.6 miles of wetland frontage along the 15-mile TDL. The nearest wetland to the site along the surface water TDL is located on Sinclair Inlet approximately 3.72 miles downstream of the site. All wetland frontage occurs on the waters of the Puget Sound. (USFWS 1997a, 1997b, 1997c, 1997d, 1997e, 1997f, 1997g, and 1997h)

7.2.3 Surface Water Samples

7.2.3.1 Sample Locations

Two surface water samples (GC03SW and GC04SW) were collected from Gorst Creek at the PPEs (Figure 3-1). Sample GC03SW was collected from the upstream PPE (PPE 1), and sample GC04SW was collected from the downstream PPE (PPE 2).

7.2.3.2 Sample Results

Results for the surface water samples are presented in Table 7-4. No pesticides/PCBS, TAL metals, SVOCS, or VOCs were detected at elevated concentrations with respect to background samples.

7.2.4 Sediment Samples

7.2.4.1 Sample Locations

A total of five sediment samples (GC02SD, GC03SD, GC04SD, GC05SD, and GC06SD) were collected from Gorst Creek. Sample GC02SD was collected from approximately 1,000 feet upstream of PPE 1. Sample GC03SD was collected from the upstream PPE (PPE 1) at the southeast end of the closed landfill where Gorst Creek enters the culvert under the landfill. Sample GC04SD was collected from the downstream PPE (PPE 2) at the northwest edge of the landfill where Gorst Creek exits the culvert under the landfill. Sample GC05SD was collected approximately 500 feet downstream of PPE 2 on the northwest side of the Highway 3 overpass. Sample GC06SD was collected approximately 1.7 mile downstream of the site and approximately 250 feet downstream of the fish rearing facility.

7.2.4.2 Sample Results

Sediment sample results are presented in Table 7-5. A total of six pesticides/PCBs were detected at elevated concentrations with respect to background ranging from 3.1 µg/kg (heptachlor in sample GC05SD) to an estimated concentration of 2,500 µg/kg (Aroclor-1254 in sample GC05SD). A total of three TAL metals were detected at elevated concentrations with respect to background, ranging from 47 mg/kg (lead in sample GC04SD) to an estimated concentration of 201 mg/kg (copper in sample GC05SD). No SVOCs or VOCs were detected at elevated concentrations with respect to background.

Samples collected upstream of the closed landfill did not contain any elevated concentrations with respect to background. Samples collected from PPE 2 and sample GC05SD (the downstream sample location) were the only samples that contained elevated concentrations.

7.3 SOIL EXPOSURE PATHWAY

The soil exposure pathway is evaluated based on the threat to resident and nearby population from soil contamination within the first 2 feet of the surface. Access to the Gorst Creek - Bremerton Auto Wrecking Landfill is restricted to an easement through the Airport Auto Wrecking, Too, facility. The site is not fenced. There are no resources located at the site. There are no residences within 200 feet of a source. There are no workers on site. The population residing within a 1 mile travel distance of the site includes 729 people (Table 7-6; EPA 2003b). There are no known schools or daycare facilities within 200 feet of a potential source, or within a 1 mile travel distance of the site. There are no terrestrially sensitive environments located on a potential source (WDFW 2002).

7.4 AIR MIGRATION PATHWAY

The air migration pathway TDL is a 4-mile radius that extends from the sources at the site (Figure 7-1). There are 6,434 permanent residents within a 4-mile radius of the site (EPA 2003b). There are approximately 10 workers at the adjacent Airport Auto Wrecking, Too, facility (located approximately 500 feet northeast of the site). The bald eagle (*H. leucocephalus*), a Federal-listed threatened species, nests within a 4-mile radius of the site (WDFW 2002). There is no commercial agriculture, silviculture, or livestock production/grazing within 0.5 mile of the site. There are 633.7 acres of designated wetlands within 4 miles of the site (EPA 2003b). Wetland acreage and population within 4 miles of the site are presented in Table 7-6.

Table 7-1

GROUNDWATER DRINKING WATER POPULATION WITHIN A 4-MILE RADIUS
GORST CREEK - BREMERTON AUTO WRECKING LANDFILL
INTEGRATED ASSESSMENT
PORT ORCHARD, WASHINGTON

Distance (miles)	Well Identification	Well Population[a]	Total Population per Distance Ring
0 to 0.25	Domestic (0)	0	0
0.25 to 0.5	Domestic (19)	51	2,051
	Municipal (1)	2,000	
0.5 to 1	Domestic (29)	78	6,078
	Municipal (3)	6,000	
1 to 2	Domestic (38)	102	6,102
	Municipal (3)	6,000	
2 to 3	Domestic (73)	196	8,203
	Community (1)	7	
	Municipal (4)	8,000	
3 to 4	Domestic (199)	533	533
Total			22,967

Sources: Cahall 2003b, DOC 2001, Ecology various dates.

[a] The domestic well population was estimated based on the average number of persons per household for Kitsap County of 2.68 people.

Table 7-2

GROUNDWATER SAMPLES ANALYTICAL RESULTS SUMMARY
GORST CREEK - BREMERTON AUTO WRECKING LANDFILL
INTEGRATED ASSESSMENT
PORT ORCHARD, WASHINGTON

EPA Sample ID	03464423	03464445	03464422
CLP Organic ID	J2791	J27B3	J2790
CLP Inorganic ID	MJ2791	NA	MJ2790
Station Location ID	BG01GW	LF01GW	MW01GW
Sample Description	Background	Borehole 6	Monitoring Well BR-11
Target Analytes/Metals (µg/L)			
Aluminum	**489**	NA	111 JB
Calcium	**6500**	NA	**7460**
Iron	**881**	NA	**201**
Manganese	**40.0**	NA	**16.2**
Mercury	0.20 UJK	NA	0.24 JK
Zinc	**26.6**	NA	24.0 U
Semivolatile Organic Compounds (µg/L)			
Bis(2-Ethylhexyl)phthalate	10 U	110	10 U
Naphthalene	10 U	35	10 U
Volatile Organic Compounds (µg/L)			
Xylenes (total)	10 U	19	10 U

Note: Bold type indicates the sample result is above the instrument detection limit.
Underline type indicates the sample result is elevated as defined in Section 5.

Key:

B = The reported concentration is between the instrument detection limit and the contract required detection limit.
CLP = Contract Laboratory Program.
EPA = United States Environmental Protection Agency.
ID = Identification.
J = The analyte was positively identified. The associated numerical result is an estimate.
K = Unknown bias.
µg/L = Micrograms per liter
U = The analyte was not detected at or above the reported result.

Table 7-3

ANNUAL SPORT CATCH FISH HARVEST WITHIN THE 15-MILE TARGET DISTANCE LIMIT GORST CREEK - BREMERTON AUTO WRECKING LANDFILL INTEGRATED ASSESSMENT PORT ORCHARD, WASHINGTON

Species	Number Harvested [a]	Average Pound per Fish	Calculation of Area Percentage [b]	Pounds Harvested
Chinook salmon (*Oncorhynchus tshawatscha*)	1,762	22	(1762 * 0.25) *.22	9,691
Coho salmon (*Oncorhynchus kisutch*)	2,105	12	(2105 * 0.25) * 12	6,315
Chum salmon (*Oncorhynchus keta*)	110	9	(110 * 0.25) * 9	247.5
Pink Salmon (*Oncorhynchus gorbuscha*)	32	4	(32 * 0.25) * 4	32
TOTAL				**16,285.5**

Source: WDFW 2002, Wydowski and Whitney 1979.

[a] Number of fish caught in Area 10, comprised of Apple Cove Point - Edwards Point line to the line through the north tip of Vashon Island east - west.

[b] Because only a portion of Area 10 is within the 15-mile TDL a calculation was performed to determine the pounds of fish harvest for Area 10. It is estimated that approximately 25% of Area 10 is within the site's TDL.

Table 7-4

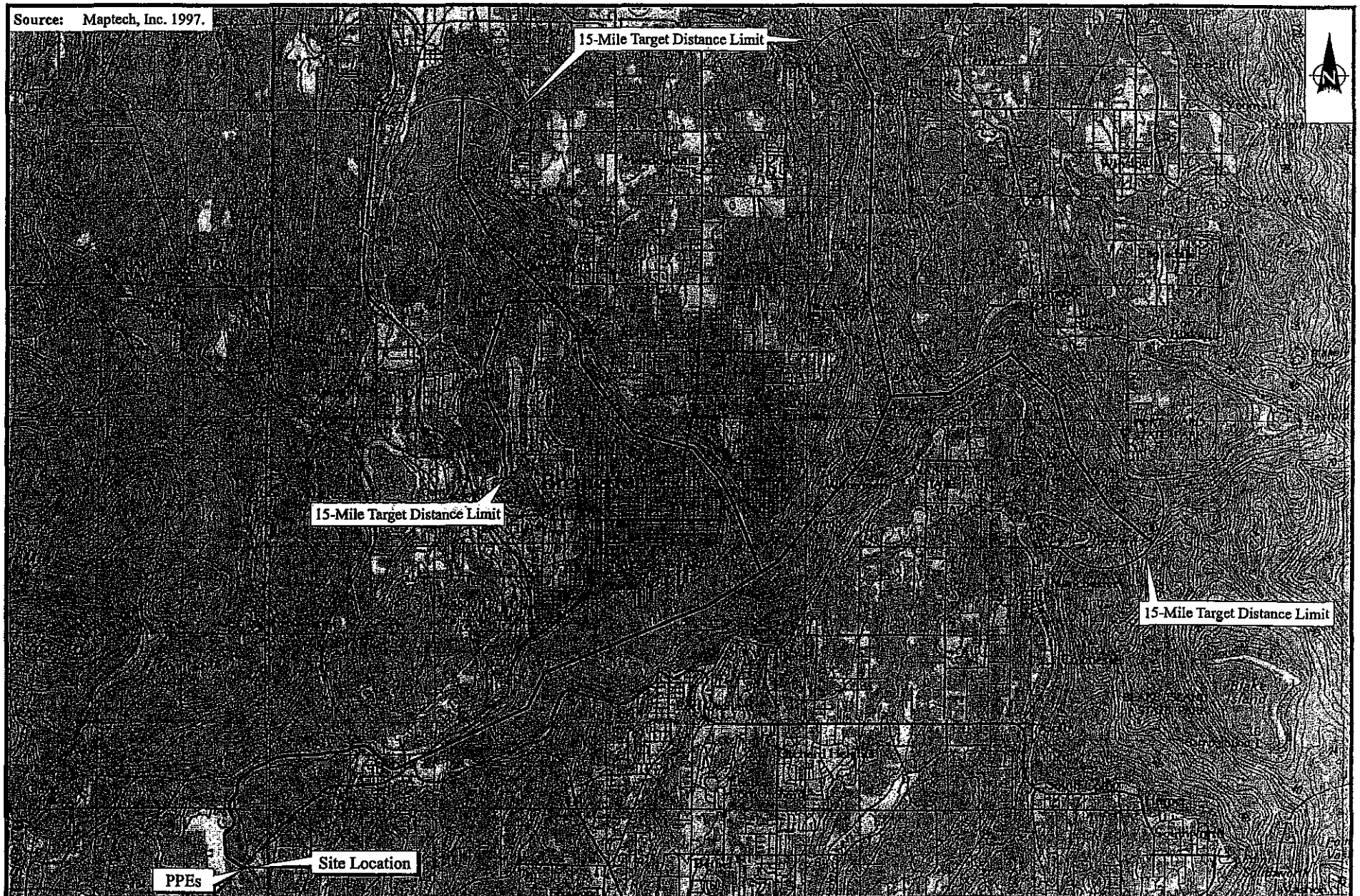
SURFACE WATER SAMPLES ANALYTICAL RESULTS SUMMARY
GORST CREEK - BREMERTON AUTO WRECKING LANDFILL
INTEGRATED ASSESSMENT
PORT ORCHARD, WASHINGTON

EPA Sample ID	03464427	03464424	03464430
CLP Organic ID	J2795	J2792	J2798
CLP Inorganic ID	MJ2795	MJ2792	MJ2798
Station Location ID	BG02SW	GC03SW	GC04SW
Description	Background	PPE 1	PPE 2
Target Analyte List Metals (µg/L)			
Calcium	1970 JB	2060 JB	6830
Iron	270	30.0 JB	31.2 JB
Manganese	17.3	3.1 JB	11.0 JB
Zinc	21.8	23.5	31.5

Note: Bold type indicates the sample result is above the instrument detection limit.

Key:

B = The reported concentration is between the instrument detection limit and the contract required detection limit.
CLP = Contract Laboratory Program.
EPA = United States Environmental Protection Agency.
ID = Identification.
J = The analyte was positively identified. The associated numerical result is an estimate.
µg/L = Micrograms per liter



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GORST CREEK-BREMERTON
AUTO WRECKING LANDFILL
INTEGRATED ASSESSMENT
Port Orchard, Washington

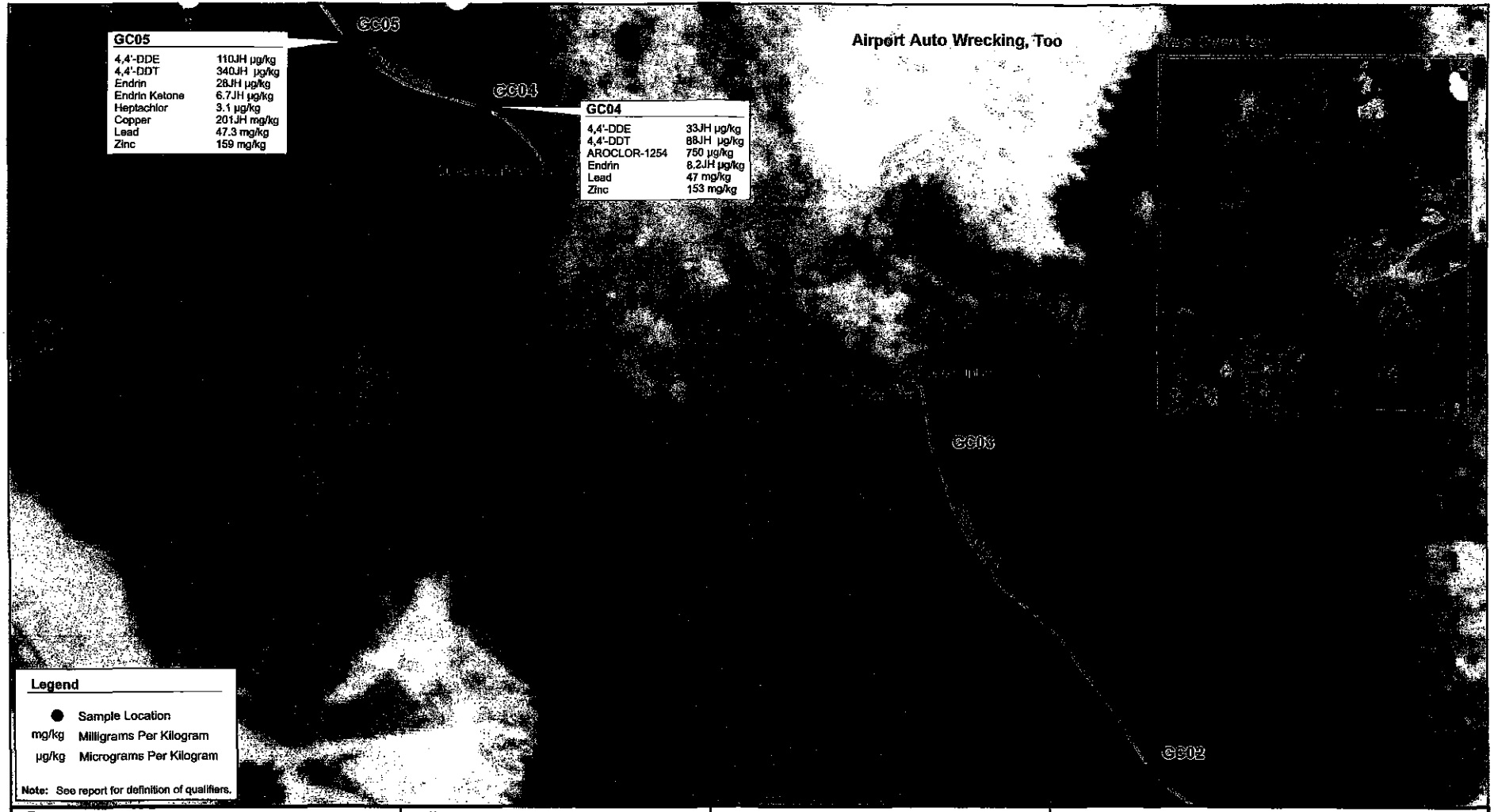
Figure 7-3
15-MILE MAP

0 .789 1.578
Approximate Scale in Miles

Date: 6/1/04

Drawn by: AES

10:START-2\03070009\S866\fig 7-3



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N W E S
0 25 50 100 150 200 250 300
Feet

Map Reference: USGS Digital OrthoPhoto Quarter Quadrangle - Bremerton West, July 7, 1994

Gorst Creek - Bremerton Auto Wrecking Landfill
Integrated Assessment
Port Orchard, Washington

Figure 7-4
SEDIMENT SAMPLES CONCENTRATION MAP

Date:	Drawn by:	Job Number:
02/12/2004	avh	001281.0291.01IA

8. REMOVAL ASSESSMENT DISCUSSION

The following subsections describe the removal assessment of on-site surface soil contamination (subsection 8.1), on-site subsurface soil contamination (subsection 8.2), on-site groundwater contamination (subsection 8.3), and potential migration of contamination off site (subsection 8.4).

The need for a removal assessment was based on the initial PA conducted in 2003 identifying three concerns at the site which may present an imminent and substantial risk to human health and the environment: the potential exposure to nearby animals or the food chain from hazardous substances found on site; the potential contamination of drinking water supplies from off-site migration of hazardous substances and that the physical condition of the site may allow for increased off-site migration of contaminants during inclement weather conditions (E & E 2003a). Samples were collected to determine if nearby federal-listed threatened species, food chain organisms, drinking water supplies, or Gorst Creek were impacted by the migration of hazardous substances from the closed landfill.

8.1 BENCHMARKS

Regulatory benchmarks have been gathered for each of the naturally occurring media from which IA samples were collected. These media are soil, groundwater, surface water, and sediment. Benchmarks are shown in the first column of the analytical results summary tables in Section 8 for comparison. Only those analytes with detections shown in Section 8 are included in the benchmark tables. The most conservative benchmark value for each analyte was selected for comparison criteria in Section 8. When no benchmark was present for a particular analyte, three times the site background concentration was used, unless the site background value was non-detect, then three times the analyte's detection limit was used. The regulatory benchmarks established specifically for comparative use at this site are hereafter in this report referred to as "site benchmarks."

8.1.1 Surface Soil and Subsurface Soil

Surface soil benchmarks are presented in Table 8-1. Values were compiled for soils from EPA Region 9 Preliminary Remediation Goals (PRGs) for residential and industrial soils and from the Washington State Model Toxics Control Act (MTCA) Method A unrestricted land use and industrial

Table 8-5

SURFACE SOIL SAMPLES ANALYTICAL RESULTS SUMMARY
GORST CREEK - BREMERTON AUTO WRECKING LANDFILL
PORT ORCHARD, WASHINGTON

EPA Sample ID		03464400	03464404	03464409	03464415	03464432	03464438
CLP Organic ID		J2768	J2772	J2777	J2783	J27A0	J27A6
CLP Inorganic ID		MJ2768	MJ2772	MJ2777	MJ2783	MJ27A0	MJ27A6
Station Location		LF01SS	LF02SS	LF03SS	LF04SS	LF05SS	LF06SS
Sample Depth (inches bgs)		0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6
Description	Benchmark	Borehole 1	Borehole 2	Borehole 3	Borehole 4	Borehole 5	Borehole 6
Pesticides/Polychlorinated Biphenyls (µg/kg)							
4,4'-DDD	2400	4.2 U	4.1 U	4.1 U	18 JH	3.9 U	3.8 U
4,4'-DDT	1700	4.2 U	4.1 U	20 JH	54 JH	4.9	15 JH
alpha-Chlordane	5.4	2.2 U	2.1 U	4.6 JH	40 UJK	2 U	2.3
Aroclor-1242	220	42 U	41 U	50 JK	40 UJK	39 U	38 U
Aroclor-1248	220	42 U	69	41 U	40 UJK	39 U	38 U
Aroclor-1254	220	42 U	41 U	50 JK	40 UJK	39 U	88 JH
Endrin aldehyde	10.5	4.2 U	4.1 U	4.1 U	4.0 U	3.9 U	4.7 JH
gamma-Chlordane	5.4	2.2 U	2.1 U	5.2 JH	20 UJK	2.0 U	2.0 U
Target Analyte List Metals (mg/kg)							
Aluminum	76000	14600	12200	12400	12400	6700	5850
Antimony	31	2.4 U	2.3 U	2.1 U	2.5 JB	2.2 UJL	2.1 UJL
Arsenic	20	5.9	3.5	4.0	7.6	2.6	3.3
Barium	5400	96.7	71.0	82.5	139	48.0 JB	29.7 JB
Beryllium	150	0.25 JB	0.22 JB	0.26 JB	0.23 JB	0.12 JB	0.13 JB
Cadmium	2	0.18 U	0.31 JB	0.40 JB	1.6	0.43 JB	0.21 JB
Calcium	8190	4600	4390	6030	4990	4440	2480
Chromium	210	33.8 JH	31.9 JH	35.3 JH	31.1 JH	17.7	13.7
Cobalt	900	12.2 JB	9.9 JB	9.9 JB	10.1 JB	6.4 JB	5.7 JB
Copper	3100	23.4	20.0	26.2	44.8	26.5 JH	14.8 JH
Iron	23000	22700	17300	18500	17100	9290	8370
Lead	250	9.6	32.0	121	278	79.9	16.2
Magnesium	11520	5810	5020	5110	4690	2910	2530
Manganese	1800	579 JH	283 JH	297 JH	291 JH	167	134 JL
Mercury	2	0.12 U	0.12 U	0.12 U	0.62	0.11 U	0.19
Nickel	1600	39.4 JL	35.1 JL	37.9 JL	35.8 JL	20.5	19.4
Potassium	1035	661 JB	615 JB	573 JB	550 JB	287 JB	213 JB
Sodium	402	235 JB	156 JB	221 JB	190 JB	151 JB	109 U
Vanadium	550	52.1	45.4	43.8	43.7	20.4	18.8
Zinc	23000	58.1	90.2	189	256	88.5	60.3
Semivolatile Organic Compounds (µg/kg)							
Benzo(a)anthracene	620	420 U	73 JQ	2100 U	4000 U	1900 U	380 U
Benzo(a)pyrene	62	420 U	70 JQ	2100 U	4000 U	1900 U	380 U
Bis(2-ehtylhexl)phthalate	35000	420 U	150 JQ	2100 U	480 JQ	1900 U	73 JQ
Butylbenzylphthalate	12000000	420 U	410 U	2100 U	480 JQ	1900 U	380 U
Chrysene	62000	420 U	150 JQ	2100 U	4000 U	1900 U	380 U
Di-n-btylphthalate	6100000	420 U	64 JQ	2100 U	4000 U	1900 U	65 JQ
Pyrene	2300000	420 U	83 JQ	2100 U	4000 U	1900 U	380 U

Note: Bold type indicates the sample result is above the instrument detection limit.
Shaded type indicates the sample result exceeds a benchamark as defined in Section 5.

Key:

B = The reported concentration is between the instrument detection limit and the contract required detection limit.
bgs = Below ground surface.
CLP = Contract Laboratory Program.
EPA = United States Environmental Protection Agency.
H = High bias.
ID = Identification.
J = The analyte was positively identified. The associated numerical result is an estimate.
K = Unknown bias.
L = Low bias.
µg/kg = Micrograms per kilogram.
mg/kg = Milligrams per kilogram.
Q = The result is estimated because the concentration is below the contract required quantitation limit.
U = The analyte was not detected at or above the reported result.

Table 8-6

SUBSURFACE SOIL SAMPLES ANALYTICAL RESULTS SUMMARY
GORST CREEK - BREMERTON AUTO WRECKING LANDFILL
PORT ORCHARD, WASHINGTON

EPA Sample ID		03464401	03464402	03464403	03464405	03464406	03464407	03464408	03464410	03464411	03464412	03464413	03464414	03464416	03464417	03464418	03464419	03464420
CLP Organic ID		J2769	J2770	J2771	J2773	J2774	J2775	J2776	J2778	J2779	J2780	J2781	J2782	J2784	J2785	J2786	J2787	J2788
CLP Inorganic ID		MJ2769	MJ2770	MJ2771	MJ2773	MJ2774	MJ2775	MJ2776	MJ2778	MJ2779	MJ2780	MJ2781	MJ2782	MJ2784	MJ2785	NA	MJ2787	NA
Station Location		LF01SB04	LF01SB08	LF01SB12	LF02SB04	LF02SB08	LF02SB12	LF02SB16	LF03SB04	LF03SB08	LF03SB12	LF03SB16	LF03SB20	LF04SB04	LF04SB08	LF04SB12	LF04SB16	LF04SB20
Sample Depth (feet bgs)		0 - 4	4 - 8	8 - 12	0 - 4	4 - 8	8 - 12	12 - 16	0 - 4	4 - 8	8 - 12	12 - 16	16 - 20	0 - 4	4 - 8	8 - 12	12 - 16	16 - 20
Description	Benchmark	Borehole 1			Borehole 2				Borehole 3					Borehole 4				
PCBs (ug/kg)																		
4,4'-DDD	2400	4.8 U	3.8 U	29 JH	4.3 U	19 U	23 JH	12 U	7.3 JH	3.7 U	3.7 U	35	4.3 U	7.6 JH	4.1 U	64 JH	29 JH	38 JH
4,4'-DDE	1700	3.8 U	3.8 U	8.9 JH	4.3 U	9.9	7.5	5.5 JH	3.7 U	11 U	6.9 JH	7.6 U	19 JH	10 JH	4.1 U	26 U	8.4 U	4.4 U
4,4'-DDT	1700	43 U	6.9	11 JH	4.3 U	43	24 JH	27 JH	13 JH	12 JH	26 JH	13 JH	29 JH	12 JH	10 JH	35 JH	13 JH	19 JH
Aldrin	29	2.0 U	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	1.9 U	1.9 U	1.9 U	1.9 U	2.0 U	2.2 U	1.9 U	2.1 U	2.0 U	2.0 U	2.1 U
alpha-Chlordane	5.4	2.0 U	2.0 U		2.2 U	28 U		4.1 U		1.9 U	2.5 JH				2.6 JH			5.3 JH
Aroclor-1242	220	38 U	38 U	120	43 U	39 UJK		100	37 U	92 JH	37 U	38 U	110	36 U	41 U		100	120
Aroclor-1254	220	38 U	38 U	90 JH	43 U	39 UJK	140 JH	170	37 U	88	140	65		62 JH	41 U		99	210
Aroclor-1260	220	38 U	38 U	45 JH	43 U	39 UJK	77 JH	120	37 U	37 U	53 JH	82	43 U	36 U	41 U	40 UJK	38 U	40 U
Beta-BHC	320	2.0 U	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	1.9 U	1.9 U	1.9 U	1.9 U	2.0 U	2.3 U	1.9 U	2.1 U	2.0 U	2.0 U	2.1 U
Dieldrin	30	3.8 U	3.8 U	3.9 U	4.3 U	11 U	9.5 U	5.1 U	3.7 U	3.7 U	5.2 U	5.0 U	14 U	3.6 U	6.9 JH	8.8 U	6.2 U	7.8 U
Endrin	18000	3.8 U	3.8 U	3.8 U	4.3 U	3.9 U	3.8 U	3.7 U	3.7 U	3.7 U	3.7 U	3.8 U	4.3 U	3.6 U	4.1 U	4.0 U	3.8 U	4.0 U
Endrin ketone	10.5	3.8 U	3.8 U	3.8 U	4.3 U		3.8 U	3.7 U	3.7 U	3.7 U	3.7 U	3.8 U	4.3 U	3.6 U	4.1 U		3.8 U	4.0 U
gamma-Chlordane	5.4		2.0 U		2.2 U					1.9 U	1.9 U				3.7 JH			2.1 U
Heptachlor	110	2.0 U	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	1.9 U	1.9 U	1.9 U	1.9 U	2.0 U	2.2 U	1.9 U	2.1 U	6.0 U	2.0 U	2.3 U
Heptachlor epoxide	53	24	2.0 U	2.0 U	2.2 U	4.9	2.0 U	3.0 U	2 U	5.0 U	1.9 U	2.1 U	9.3 U	2.1 U	2.1 U	11 U	2.0 U	7.4 U
Inorganics (mg/kg)																		
Aluminum	76000	12500	9710	9650	12300	10400	12500	14800	10300	13700	11400	12400	12900	11500	9850	NA	11600	NA
Antimony	31	2.1 U	3.5 JB	3.8 JB	2.3 U	2.3 U	2.1 U	2.1 U	4.0 JB	2.5 JB	2.1 JB	2.1 U	2.3 U	2.3 JB	2.3 JB	NA	9.1 JB	NA
Arsenic	20	6.8	16.0	3.2	4.1	1.8 JB	2.8	2.6	9.5	6.6	5.7	1.3 U	5.7	5.7	9.8	NA	14.2	NA
Barium	5400	118	189	63.7	80.5	125	120	144	95.8	227	76.4	110	137	129	102	NA	127	NA
Beryllium	150	0.28 JB	0.40 JB	0.18 JB	0.23 JB	0.25 JB	0.23 JB	0.24 JB	0.24 JB	0.28 JB	0.21 JB	0.23 JB	0.20 JB	0.26 JB	0.22 JB	NA	0.27 JB	NA
Cadmium	2	0.59 JB	0.24 JB	0.67 JB	0.41 JB	0.51 JB	0.46 JB	0.40 JB	0.16 U	0.33 JB	0.28 JB	0.20 JB	0.46 JB	0.20 JB	0.23 JB	NA	1.2 JB	NA
Calcium	2580															NA		NA
Chromium	210	26.2 JH	20.2 JH	28.0 JH	31.8 JH	21.2 JH	23.0 JH	24.5 JH	20.7 JH	23.5 JH	20.5 JH	22.3 JH	30.6 JH	21.6 JH	21.6 JH	NA	23.7 JH	NA
Cobalt	900	12.0	8.3 JB	8.3 JB	10.2 JB	8.4 JB	9.1 JB	9.9 JB	7.1 JB	8.3 JB	8.6 JB	9.7 JB	9.8 JB	7.9 JB	7.8 JB	NA	8.8 JB	NA
Copper	3100	26.1	44.2	43.8	28.6	19.6	24.2	21.1	23.4	25.5	19.3	21.7	31.8	21.0	23.2	NA	39.8	NA
Iron	23000	15900	14100	16100	17100	14000	16200	17100	12200	15200	14000	16700		13700	13100	NA		NA
Lead	250	113		57.4	48.5	202	141	167	180		185	68.9	149			NA	96.4	NA
Magnesium	8760	4330	4100	4190	5220	4050	4010	4000	4230	4410	3930	3990	4020	4240	3480	NA	3720	NA
Manganese	1800	357 JH	283 JH	314 JH	285 JH	183 JH	243 JH	259 JH	274 JH	262 JH	214 JH	228 JH	299 JH	255 JH	245 JH	NA	265 JH	NA
Mercury	2	0.26 U	0.28 U	0.12 U	0.27 U	0.20 U	1.1	0.22 U	0.50	0.30 U	0.11 U	0.13	0.19 U	0.22 U	0.32 U	NA	0.16 U	NA
Nickel	1600	32.3 JL	29.2 JL	34.1 JL	37.2 JL	34.2 JL	34.4 JL	40.3 JL	27.6 JL	32.5 JL	32.0 JL	33.7 JL	33.8 JL	30.6 JL	29.2 JL	NA	33.6 JL	NA
Potassium	750	384 JB	580 JB	472 JB	576 JB	433 JB	423 JB	453 JB	382 JB	564 JB	504 JB	515 JB	496 JB	453 JB	559 JB	NA	626 JB	NA
Silver	390	0.32 UJL	0.32 UJL	0.52 JB	0.35 UJL	0.35 UJL	0.32 UJL	0.31 UJL	0.32 UJL	0.32 UJL	0.32 UJL	5.0 JL	0.35 UJL	0.32 UJL	0.33 UJL	NA	0.34 UJL	NA
Sodium	309	135 JB	287 JB	186 JB	141 JB	118 U	108 U	240 JB	177 JB		266 JB	206 JB	183 JB	257 JB	308 JB	NA		NA
Vanadium	550	36.6	29.6	36.2	43.8	30.2	35.7	37.9	29.5	35.9	33.4	36.4	33.1	34.5	28.0	NA	29.1	NA
Zinc	23000	112	161	134	131	267	215	279	110	204	122	98.8	185	137	144	NA	982	NA

Key is at the end of the table.

Table 8-6

SUBSURFACE SOIL SAMPLES ANALYTICAL RESULTS SUMMARY
GORST CREEK - BREMERTON AUTO WRECKING LANDFILL
PORT ORCHARD, WASHINGTON

EPA Sample ID		03464401	03464402	03464403	03464405	03464406	03464407	03464408	03464410	03464411	03464412	03464413	03464414	03464416	03464417	03464418	03464419	03464420
CLP Organic ID		J2769	J2770	J2771	J2773	J2774	J2775	J2776	J2778	J2779	J2780	J2781	J2782	J2784	J2785	J2786	J2787	J2788
CLP Inorganic ID		MJ2769	MJ2770	MJ2771	MJ2773	MJ2774	MJ2775	MJ2776	MJ2778	MJ2779	MJ2780	MJ2781	MJ2782	MJ2784	MJ2785	NA	MJ2787	NA
Station Location		LF01SB04	LF01SB08	LF01SB12	LF02SB04	LF02SB08	LF02SB12	LF02SB16	LF03SB04	LF03SB08	LF03SB12	LF03SB16	LF03SB20	LF04SB04	LF04SB08	LF04SB12	LF04SB16	LF04SB20
Sample Depth (feet bgs)		0 - 4	4 - 8	8 - 12	0 - 4	4 - 8	8 - 12	12 - 16	0 - 4	4 - 8	8 - 12	12 - 16	16 - 20	0 - 4	4 - 8	8 - 12	12 - 16	16 - 20
Description	Benchmark	Borehole 1			Borehole 2				Borehole 3					Borehole 4				
Semivolatile Organics																		
1,1'-Biphenyl	350000	380 U	380 U	NA	430 U	2000 U	380 U	370 U	370 U	380 U	380 U	380 U	430 U	360 U	410 U	NA	380 U	NA
2-Methylnaphthalene	1050	380 U	380 U	NA	430 U	2000 U	73 JQ	370 U	370 U	73 JQ	380 U	380 U	430 U	360 U	410 U	NA	380 U	NA
Acenaphthene	3700000	380 U	380 U	NA	430 U	2000 U	380 U	370 U	370 U	110 JQ	380 U	380 U	430 U	360 U	410 U	NA	380 U	NA
Acetophenone	1050	260 JQ	380 U	NA	430 U	2000 U	380 U	370 U	370 U	380 U	380 U	380 U	430 U	360 U	410 U	NA	380 U	NA
Anthracene	22000000	380 U	380 U	NA	430 U	2000 U	380 U	370 U	52 JQ	180 JQ	380 U	380 U	430 U	52 JQ	410 U	NA	380 U	NA
Benzo(a)anthracene	620	55 JQ	66 JQ	NA	430 U	210 JQ	43 JQ	150 JQ	170 JQ	270 JQ	41 JQ	380 U	430 U	160 JQ	80 JQ	NA	48 JQ	NA
Benzo(a)pyrene	62	55 JQ	54 JQ	NA	430 U	2000 U	380 U	[redacted]	[redacted]	[redacted]	380 U	380 U	430 U	[redacted]	58 JQ	NA	40 JQ	NA
Benzo(b)Fluoranthene	620	79 JQ	72 JQ	NA	430 U	2000 U	380 U	140 JQ	140 JQ	240 JQ	380 U	380 U	430 U	120 JQ	69 JQ	NA	380 U	NA
Benzo(k)fluoranthene	6200	41 JQ	51 JQ	NA	430 U	2000 U	380 U	110 JQ	130 JQ	170 JQ	380 U	380 U	430 U	100 JQ	51 JQ	NA	380 U	NA
Bis(2-ethylhexyl)phthalate	35000	15000	55 JQ	NA	130 JQ	4200	360 JQ	460	180 JQ	190 JQ	340 JQ	6000	740	450	410 U	NA	930	NA
Butylbenzylphthalate	120000000	4400	380 U	NA	190 JQ	2000 U	190 JQ	93 JQ	170 JQ	380 U	380 U	920	430 U	45 JQ	53 JQ	NA	6100	NA
Cabazole	24000	380 U	380 U	NA	430 U	2000 U	380 U	370 U	370 U	110 JQ	380 U	380 U	430 U	360 U	410 U	NA	380 U	NA
Chrysene	62000	73 JQ	81 JQ	NA	51 JQ	240 JQ	52 JQ	190 JQ	210 JQ	310 JQ	45 JQ	40 JQ	58 JQ	200 JQ	100 JQ	NA	98 JQ	NA
Dibenzofuran	290000	380 U	380 U	NA	430 U	2000 U	380 U	370 U	370 U	47 JQ	380 U	380 U	430 U	360 U	410 U	NA	380 U	NA
Di-n-butylphthalate	6100000	46 JQ	61 JQ	NA	50 JQ	230 JQ	210 JQ	140 JQ	280 JQ	87 JQ	380 U	380 U	430 U	53 JQ	410 U	NA	58 JQ	NA
Di-n-octylphthalate	24000000	380 U	380 U	NA	430 U	2000 U	380 U	370 U	370 U	380 U	380 U	380 U	430 U	360 U	410 U	NA	380 U	NA
Fluoranthene	2300000	73 JQ	120 JQ	NA	430 U	310 JQ	57 JQ	280 JQ	270 JQ	640	62 JQ	380 U	430 U	260 JQ	92 JQ	NA	62 JQ	NA
Fluorene	2700000	380 U	380 U	NA	430 U	2000 U	380 U	370 U	370 U	120 JQ	380 U	380 U	430 U	360 U	410 U	NA	380 U	NA
Indeno(1,2,3-CD)-pyrene	620	380 U	380 U	NA	430 U	2000 U	380 U	92 JQ	71 JQ	89 JQ	380 U	380 U	430 U	77 JQ	46 JQ	NA	380 U	NA
Naphthalene	5000	380 U	380 U	NA	430 U	2000 U	170 JQ	53 JQ	370 U	150 JQ	380 U	380 U	430 U	360 U	410 U	NA	380 U	NA
Phenanthrene	1050	53 JQ	83 JQ	NA	430 U	2000 U	79 JQ	120 JQ	220 JQ	950	38 JQ	380 U	72 JQ	280 JQ	68 JQ	NA	65 JQ	NA
Pyrene	2300000	92 JQ	130 JQ	NA	72 JQ	360 JQ	61 JQ	230 JQ	300 JQ	660	75 JQ	380 U	68 JQ	270 JQ	110 JQ	NA	95 JQ	NA
Volatile Organics																		
1,4-Dichlorobenzene	3400	NA	12 U	11 U	13 U	12 U	11 JQ	5 JQ	11 U	11 U	11 U	11 U	13 U	11 U	12 U	12 U	12 U	7 JQ
2-Butanone	7300000	NA	12 U	6 JQ	13 U	12 U	13	8 JQ	11 U	11 U	11 U	11 JQ	13 U	11 U	12 U	6 JQ	7 JQ	12 U
4-Methyl-2-pentanone	790000	NA	12 UJK	11 U	13 UJK	12 UJK	3 JQ	11 UJK	11 UJK	11 UJK	11 U	11 U	13 U	11 U	12 U	12 U	12 U	12 U
Acetone	1600000	NA	12 U	44	13 U	12 U	97	67	11 U	34 U	3 JQ	61	5 JQ	11 U	12 U	46	42	43 JQ
Carbon disulfide	360000	NA	12 U	11 JQ	13 U	12 U	2 JQ	11 U	11 U	5 JQ	11 U	2 JQ	11 JQ	11 U	12 U	10 JQ	3 JQ	11 JK
Chlorobenzene	150000	NA	12 U	11 U	13 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	13 U	11 U	12 U	12 U	12 U	12 U
Ethylbenzene	6000	NA	12 U	11 U	13 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	13 U	11 U	12 U	12 U	11 JQ	3 JQ
Isopropylbenzene	570000	NA	12 U	11 U	13 U	12 U	11 U	11 U	11 U	11 U	11 U	3 JQ	13 U	11 U	12 U	3 JQ	12 U	12 U
Methylcyclohexane	2600000	NA	12 U	11 U	13 U	12 U	11 U	11 U	11 U	11 U	11 U	16	9 JQ	11 U	12 U	12 U	12 U	12 U
Total xylenes	9000	NA	12 U	11 U	13 U	12 U	11 U	11 U	11 U	11 U	11 U	17	4 JQ	11 U	12 U	12 U	1400 JL	95

Key is at the end of the table.

Table 8-6

SUBSURFACE SOIL SAMPLES ANALYTICAL RESULTS SUMMARY
GORST CREEK - BREMERTON AUTO WRECKING LANDFILL
PORT ORCHARD, WASHINGTON

EPA Sample ID		03464433	03464434	03464435	03464436	03464437	03464439	03464440	03464441	03464442
CLP Organic ID		J27A1	J27A2	J27A3	J27A4	J27A5	J27A7	J27A8	J27A9	J27B0
CLP Inorganic ID		MJ27A1	MJ27A2	MJ27A3	MJ27A4	MJ27A5	MJ27A7	MJ27A8	MJ27A9	NA
Station Location		LF05SB04	LF05SB08	LF05SB12	LF05SB16	LF05SB20	LF06SB04	LF06SB08	LF06SB12	LF06SB16
Sample Depth (feet bgs)		0 - 4	4 - 8	8 - 12	12 - 16	16 - 20	0 - 4	4 - 8	8 - 12	12 - 16
Description	Benchmark	Borehole 5					Borehole 6			
Pesticides/PCBs										
4,4'-DDD	2400	3.8 U	3.6 U	3.6 U	3.5 U	3.7 U	3.9 U	3.9 U	74 JH	64 JH
4,4'-DDE	1700	3.8 U	4.6 JH	3.6 U	3.5 U	3.7 U	5.6 U	3.9 U	40	20 JH
4,4'-DDT	1700	10	7.1 JH	3.6 U	3.5 U	3.7 U	16 JH	33 JH	77 JH	19 JH
Aldrin	29	2.0 U	1.9 U	1.8 U	1.8 U	1.9 U	2.0 U	2.0 U	2.0 U	
alpha-Chlordane	5.4	4.8 JH		1.8 U	1.8 U	1.9 U				
Aroclor-1242	220	38 U	36 U	36 U	35 U	37 U	39 UJK	39 UJK	38 UJK	
Aroclor-1254	220	38 U	36 U	36 U	35 U	37 U	39 UJK	39 UJK	190 JH	
Aroclor-1260	220	38 U	36 U	36 U	35 U	37 U	39 UJK	39 UJK	38 UJK	52 UJH
Beta-BHC	320	2.0 U	1.9 U	1.8 U	1.8 U	1.9 U	15 U	2.0 U	19	2.7 U
Dieldrin	30	3.8 U	3.6 U	3.6 U	3.5 U	3.7 U	5.6 U	3.9 U		
Endrin	18000	3.8 U	3.6 U	3.6 U	3.5 U	3.7 U	3.9 U	6.2 JH	7.1 U	5.2 U
Endrin ketone	10.5	3.8 U	3.6 U	3.6 U	3.5 U	3.7 U	6.2 JH		3.8 U	5.2 U
gamma-Chlordane	5.4	5.1		1.8 U	1.8 U	1.9 U				9.5 U
Heptachlor	110	2.0 U	1.9 U	1.8 U	1.8 U	1.9 U	2.0 U	2.0 U	4.5 JH	8.0 U
Heptachlor epoxide	53	2.0 U	3.8 JH	1.8 U	1.8 U	1.9 U	2.0 U	2.7 JH	2.0 U	2.7 U
Inorganics										
Aluminum	76000	7510	9840	9190	7830	8150	8060	7370	9270	NA
Antimony	31	2.4 JB	9.1 JB	2.0 UJL	1.9 UJL	2.0 UJL	4.3 JB	2.7 JB	4.6 JB	NA
Arsenic	20	5.8		1.2 U	1.2 U	1.3 U	8.3	4.2	6.8	NA
Barium	5400	72.6	79.0	52.6	46.7	52.1	266	168	180	NA
Beryllium	150	0.16 JB	0.20 JB	0.20 JB	0.18 JB	0.21 JB	0.23 JB	0.25 JB	0.25 JB	NA
Cadmium	2	0.20 JB	0.16 U	0.15 U	0.15 U	0.15 U	0.77 JB	0.62 JB	1.4	NA
Calcium	2580									NA
Chromium	210	19.9	21.4	19.9	15.7	15.1	25.9	20.0	51.5	NA
Cobalt	900	8.0 JB	9.1 JB	7.6 JB	6.9 JB	7.2 JB	6.7 JB	6.8 JB	9.0 JB	NA
Copper	3100	33.3 JH	27.9 JH	11.9 JH	11.8 JH	11.2 JH	61.3 JH	112 JH	43.0 JH	NA
Iron	23000	17700	13800	10400	10000	9150	12100	12200		NA
Lead	250	94.4	98.2	2.7	2.4	2.5				NA
Magnesium	8760	3470	3300	3290	2900	3100	2660	2960	3400	NA
Manganese	1800	236 JL	182 JL	112 JL	132 JL	142 JL	223 JL	195 JL	424 JL	NA
Mercury	2	0.12 U	0.11 U	0.11 U	0.10 U	0.11 U	0.36	0.52	1.1	NA
Nickel	1600	25.9	25.0	29.3	24.8	24.9	22.5	25.8	34.5	NA
Potassium	750	472 JB	486 JB	269 JB	262 JB	291 JB	278 JB	427 JB	373 JB	NA
Silver	390	0.33 UJL	0.31 UJL	0.30 UJL	0.29 UJL	0.31 UJL	0.34 UJL	0.32 UJL	0.37 UJL	NA
Sodium	309	139 JB		101 U	98.2 U	225 JB	142 JB	261 JB	282 JB	NA
Vanadium	550	27.9	24.3	26.0	24.8	20.0	25.9	23.7	30.2	NA
Zinc	23000	176	209	26.1	22.9	22.8	470	278	1090	NA

Table 8-6

SUBSURFACE SOIL SAMPLES ANALYTICAL RESULTS SUMMARY
GORST CREEK - BREMERTON AUTO WRECKING LANDFILL
PORT ORCHARD, WASHINGTON

EPA Sample ID		03464433	03464434	03464435	03464436	03464437	03464439	03464440	03464441	03464442
CLP Organic ID		J27A1	J27A2	J27A3	J27A4	J27A5	J27A7	J27A8	J27A9	J27B0
CLP Inorganic ID		MJ27A1	MJ27A2	MJ27A3	MJ27A4	MJ27A5	MJ27A7	MJ27A8	MJ27A9	NA
Station Location		LF05SB04	LF05SB08	LF05SB12	LF05SB16	LF05SB20	LF06SB04	LF06SB08	LF06SB12	LF06SB16
Sample Depth (feet bgs)		0 - 4	4 - 8	8 - 12	12 - 16	16 - 20	0 - 4	4 - 8	8 - 12	12 - 16
Description	Benchmark	Borehole 5					Borehole 6			
1,1'-Biphenyl	350000	1900 U	360 U	360 U	350 U	370 U	780 JQ	5800	1800 JQ	5200 U
2-Methylnaphthalene	1050	1900 U	360 U	360 U	350 U	370 U	560 JQ	[redacted]	[redacted]	5200 U
Acenapthene	3700000	1900 U	360 U	360 U	350 U	370 U	3500	26000	8500	5200 U
Acetophenone	1050	1900 U	360 U	360 U	350 U	370 U	2000 U	3900 U	3800 U	5200 U
Anthracene	22000000	1900 U	360 U	360 U	350 U	370 U	3400	17000	5700	5200 U
Benzo(a)anthracene	620	1900 U	360 U	360 U	350 U	370 U	[redacted]	[redacted]	[redacted]	5200 U
Benzo(a)pyrene	62	1900 U	43 JQ	360 U	350 U	370 U	[redacted]	3900 U	[redacted]	5200 U
Benzo(b)Fluoranthene	620	1900 U	360 U	360 U	350 U	370 U	360 JQ	3900 U	590 JQ	5200 U
Benzo(k)fluoranthene	6200	1900 U	360 U	360 U	350 U	370 U	410 JQ	3900 U	480 JQ	5200 U
Bis(2-ethylhexyl)phthalate	35000	210 JQ	93 JQ	41 JQ	350 U	370 U	240 JQ	480 JQ	10000	[redacted]
Butylbenzylphthalate	120000000	1900 U	190 JQ	360 U	350 U	370 U	2000 U	3900 U	1100 JQ	580 JQ
Cabazole	24000	1900 U	76 JQ	360 U	350 U	370 U	840 JQ	3400 JQ	1200 JQ	5200 U
Chrysene	62000	1900 U	360 U	360 U	350 U	370 U	650 JQ	1900 JQ	1200 JQ	5200 U
Dibenzofuran	290000	1900 U	360 U	360 U	350 U	370 U	3400	22000	7000	5200 U
Di-n-butylphthalate	6100000	1900 U	87 JQ	360 U	350 U	50 JQ	2000 U	3900 U	3800 U	5200 U
Di-n-octylphthalate	2400000	1900 U	360 U	360 U	350 U	370 U	2000 U	3900 U	560 JQ	5200 U
Fluoranthene	2300000	1900 U	50 JQ	360 U	350 U	370 U	3800	19000	7300	5200 U
Fluorene	2700000	1900 U	360 U	360 U	350 U	370 U	3300	24000	7500	5200 U
Indeno(1,2,3-CD)-pyrene	620	1900 U	360 U	360 U	350 U	370 U	2000 U	3900 U	3800 U	5200 U
Naphthalene	5000	1900 U	360 U	360 U	350 U	370 U	4800	[redacted]	[redacted]	1700 JQ
Phenanthrene	1050	1900 U	82 JQ	360 U	350 U	370 U	[redacted]	[redacted]	[redacted]	5200 U
Pyrene	2300000	1900 U	460	71 JQ	350 U	370 U	2500	10000	4400	5200 U
1,4-Dichlorobenzene	3400	11 U	11 U	11 U	11 U	11 U	12 U	12 U	11 U	NA
2-Butanone	7300000	11 U	11 U	11 U	11 U	11 U	12 U	5 JQ	11 U	NA
4-Methyl-2-pentanone	790000	11 U	11 U	11 U	11 U	11 UJK	12 UJK	12 UJK	11 UJK	NA
Acetone	1600000	3 UJK	4 UJK	4 UJK	11 UJK	11 U	12 U	35	28	NA
Carbon disulfide	360000	11 U	11 U	11 U	11 U	11 U	12 U	12 U	11 U	NA
Chlorobenzene	150000	11 U	11 U	11 U	11 U	11 U	12 U	12 U	11 U	NA
Ethylbenzene	6000	11 U	11 U	11 U	11 U	11 U	12 U	3 JQ	11 U	NA
Isopropylbenzene	570000	11 U	11 U	11 U	11 U	11 U	12 U	6 JQ	11 U	NA
Methylcyclohexane	2600000	11 U	11 U	11 U	11 U	11 U	12 U	12 U	11 U	NA
Total xylenes	9000	11 U	11 U	11 U	11 U	11 U	12 U	17	11 U	NA

Note: Bold type indicates the sample result is above the instrument detection limit.
Shaded type indicates the sample result exceeds a benchmark as defined in Section 5.

Key:

B	= The reported concentration is between the instrument detection limit and the contract required detection limit.
bgs	= below ground surface.
CLP	= Contract Laboratory Program.
DDD	= Dichlorodiphenyldichloroethane.
DDE	= Dichlorodiphenyldichloroethylene.
DDT	= Dichlorodiphenyltrichloroethane.
EPA	= United States Environmental Protection Agency.
H	= High bias.
ID	= Identification.
J	= The analyte was positively identified. The associated numerical result is an estimate.
K	= Unknown bias.
L	= Low bias.
µg/kg	= micrograms per kilogram.
mg/kg	= milligrams per kilogram.
Q	= The result is estimated because the concentration is below the contract required quantitation limit.
U	= The analyte was not detected at or above the reported result.

Table 8-9

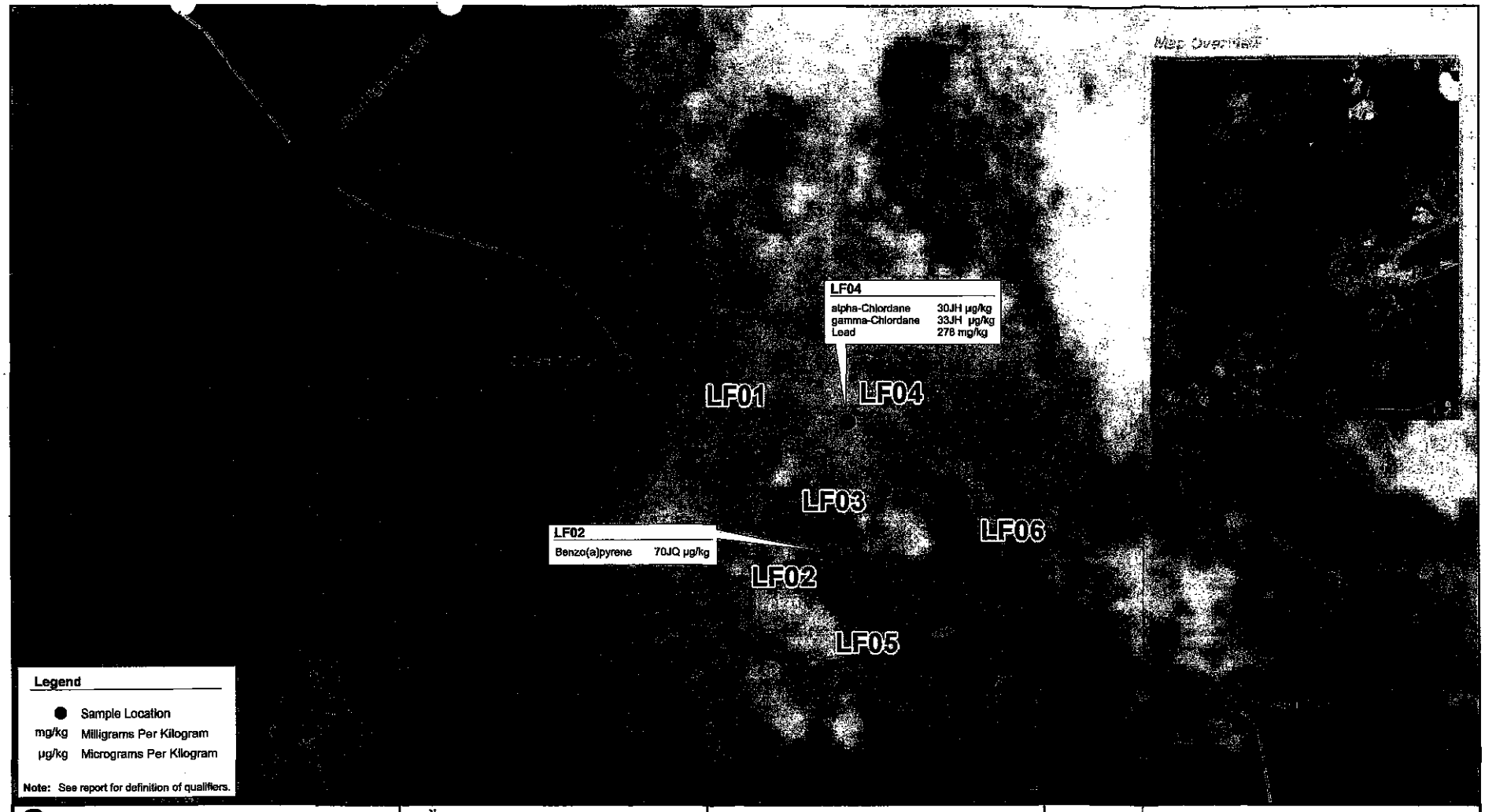
SEDIMENT SAMPLES ANALYTICAL RESULTS SUMMARY
GORST CREEK - BREMERTON AUTO WRECKING LANDFILL INTEGRATED ASSESSMENT
PORT ORCHARD, WASHINGTON

EPA Sample ID		03464425	03464426	03464429	03464431	03464447
CLP Organic ID		J2793	J2794	J2797	J2799	J27B5
CLP Inorganic ID		MJ2793	MJ2794	MJ2797	MJ2799	MJ27B5
Station Location		GC03SD	GC02SD	GC05SD	GC04SD	GC06SD
Sample Depth (inches bgs)		0 - 6	0 - 6	0 - 6	0 - 6	0 - 6
Description	Benchmark	Gorst Creek				
Pesticides/Polychlorinated biphenyls (µg/kg)						
4,4'-DDD	3.54	4.0 U	4.3 U	4.8 UN	4.6 U	4.1 U
4,4'-DDE	1.42	4.0 U	4.3 U	4.8 UH	4.6 UH	4.1 U
4,4'-DDT	6.98	4.0 U	4.3 U	4.8 UH	4.6 UH	4.1 U
Aroclor-1254	129	40 U	43 U	48 UH	46 U	41 U
Endrin	2.67	4.0 U	4.3 U	4.8 UH	4.6 UH	4.1 U
Endrin Ketone	12.9	4.0 U	4.3 U	6.7 JH	4.6 U	4.1 U
Heptachlor	6.6	2.0 U	2.2 U	3.1	2.4 U	2.1 U
Target Analyte List Metals (mg/kg)						
Aluminum	35100	5240	8230	6560	7440	5970
Antimony	8.1	2.2 UJL	2.3 UJL	3.8 JB	3.3 JB	2.3 UJL
Arsenic	5.9	1.4 U	2.3 JB	1.3 U	1.5 U	1.4 U
Barium	237.6	36.1 JB	51.5	51.1	59.3	34.5 JB
Beryllium	0.78	0.12 JB	0.20 JB	0.14 JB	0.17 JB	0.12 JB
Cadmium	0.596	0.17 U	0.18 U	0.37 JB	0.65 JB	0.17 U
Calcium	5460	1400	1700	1860	1970	1860
Chromium	37.3	11.2	17.3	17.0	14.1	14.1
Cobalt	42.6	5.6 JB	9.0 JB	5.9 JB	6.1 JB	5.4 JB
Copper	35.7	7.1 JH	9.9 JH	20.1 JH	26.5 JH	9.5 JH
Iron	49500	9080	14900	10400	9040	8320
Lead	35	4.5	5.3	4.2	4.0	2.7
Magnesium	9720	2000	3910	2780	2460	2480
Manganese	2403	347 JL	506 JL	205 JL	333 JL	139 JL
Nickel	18	19.3	36.4	29.5	27.0	22.3
Potassium	684	118 JB	181 JB	228 JB	208 JB	153 JB
Sodium	408	114 U	119 U	112 JB	124 U	117 U
Vanadium	120.6	22.0	38.2	19.6	19.1	19.8
Zinc	123.1	33.3	44.1	45.9	45.5	24.5
Semivolatile Organic Compounds (µg/kg)						
Bis(2-ethylhexyl)phthalate	47000	400 U	430 U	100 JQ	110 JQ	410 U
Di-n-butylphthalate	220000	400 U	430 U	380 U	53 JQ	410 U
Volatile Organic Compounds (µg/kg)						
Acetone	39	12 UJK	13 U	12 U	14 UJK	7 JQ
Toluene	39	12 U	13 U	12 U	14 U	5 JQ

Note: Bold type indicates the sample result is above the instrument detection limit.
Shaded type indicates the sample result exceeds a benchmark as defined in Section 5.

Key:

B = The reported concentration is between the instrument detection limit and the contract required detection limit.
bgs = Below ground surface.
CLP = Contract Laboratory Program.
EPA = United States Environmental Protection Agency.
H = High bias.
ID = Identification.
J = The analyte was positively identified. The associated numerical result is an estimate.
K = Unknown bias.
L = Low bias.
µg/kg = Micrograms per kilogram.
mg/kg = Milligrams per kilogram.
N = There is evidence the analyte is present.
Q = The result is estimated because the concentration is below the contract required quantitation limit.
U = The analyte was not detected at or above the reported result.



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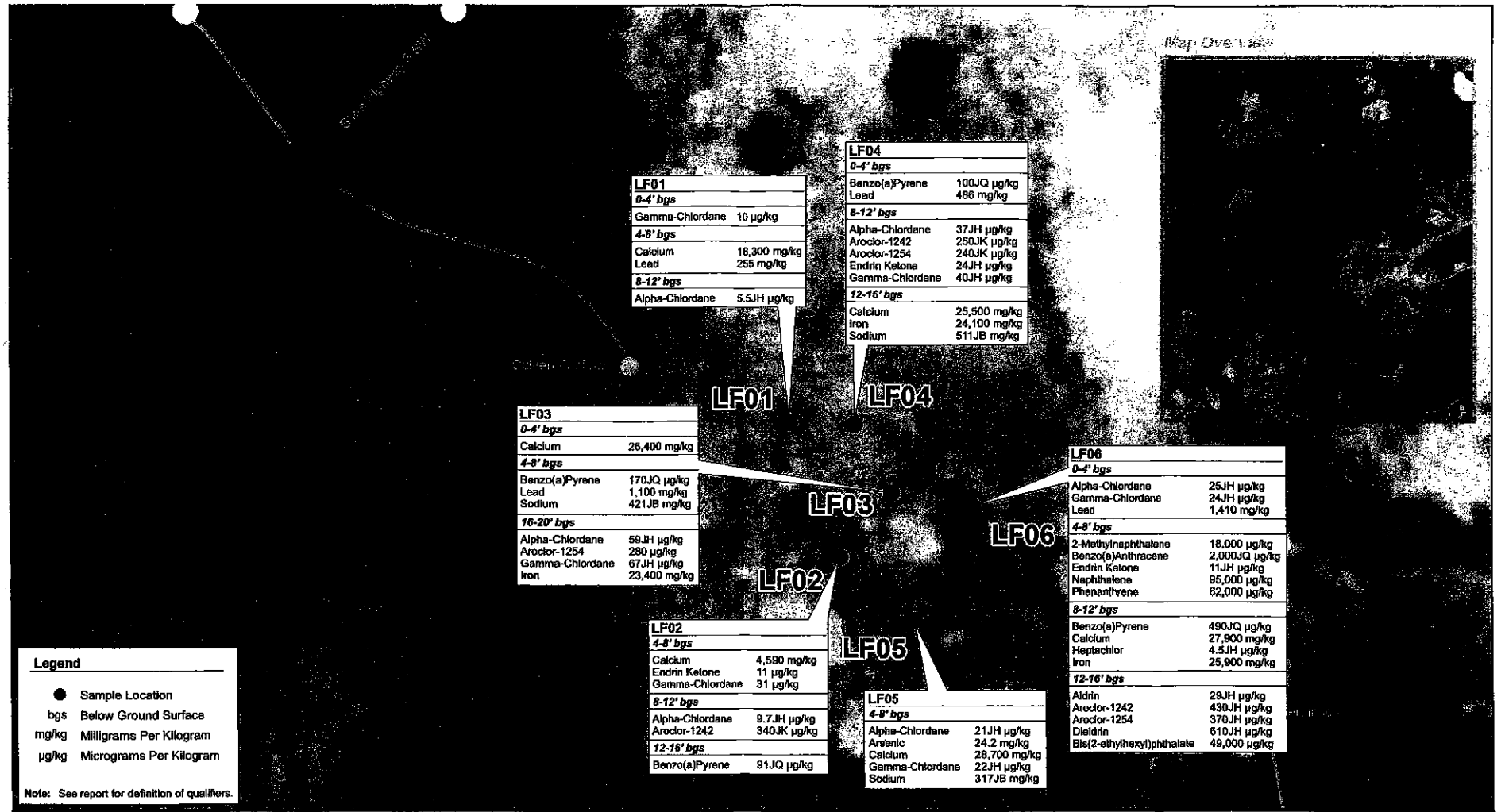
Map Reference: USGS Digital OrthoPhoto Quarter Quadrangle - Bremerton West, July 7, 1994

Gorst Creek - Bremerton Auto Wrecking Landfill
Integrated Assessment
Port Orchard, Washington

Figure 8-1
SURFACE SOIL SAMPLES CONCENTRATION MAP

Date:	Drawn By:	Job Number:
02/12/2004	avh	001281.0291.01IA



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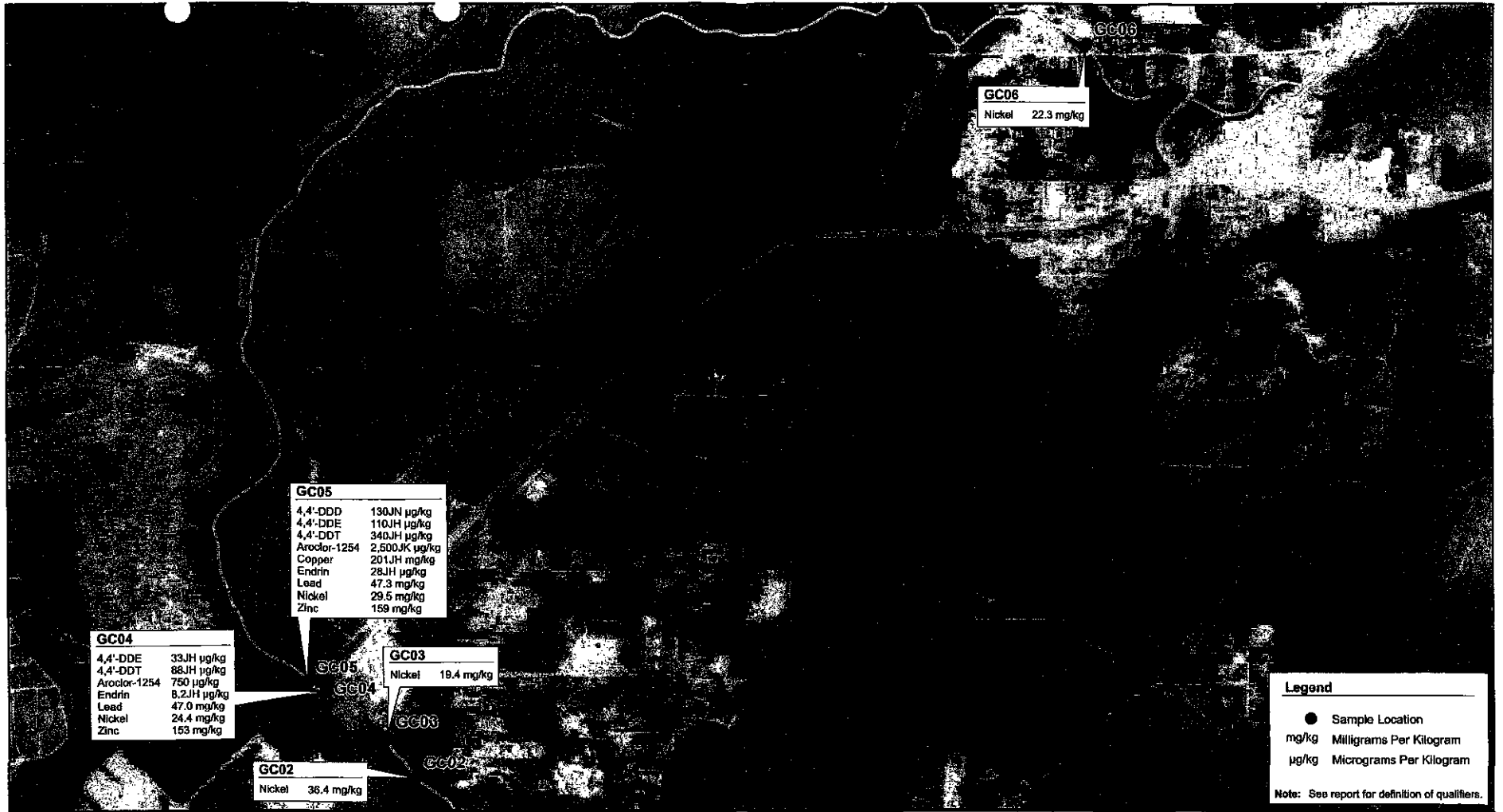
N W S
0 20 40 80 120 160 200
Feet

Map Reference: USGS Digital OrthoPhoto Quarter Quadrangle - Bremerton West, July 7, 1994

Gorst Creek - Bremerton Auto Wrecking Landfill
Integrated Assessment
Port Orchard, Washington

Figure 8-2
SUBSURFACE SOIL SAMPLES CONCENTRATION MAP

Date:	Drawn by:	Job Number:
02/12/2004	avh	001281.0291.01IA



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Portland, Oregon

Map Reference: USGS Quadrangle - Bremerton West

Gorst Creek - Bremerton Auto Wrecking Landfill
Integrated Assessment
Port Orchard, Washington

Figure 8-3
SEDIMENT SAMPLE CONCENTRATION MAP

Date:	Drawn by:	Job Number:
02/12/2004	avh	001281.0291.01IA

9. SUMMARY AND CONCLUSIONS

In November 2003, the START-2 conducted IA sampling activities at the Gorst Creek - Bremerton Auto Wrecking Landfill which is located in Port Orchard, Washington. The site is a closed landfill located over the Gorst Creek ravine. In 1968, a 24-inch diameter corrugated steel culvert was installed in the ravine to allow passage of Gorst Creek through the landfill. The ravine was subsequently filled with waste and overburden. Gorst Creek flows through the closed landfill via the underground culvert.

The IA involved the collection of samples from potential hazardous substance sources on site and from target areas potentially impacted through contamination migration. A total of 46 samples were collected for the IA, including background and QA samples. Samples were collected from on-site surface and subsurface soils, as well as sediments and surface water in target areas. Additionally, one City of Bremerton monitoring well sample and one on-site groundwater sample were collected.

9.1 SOURCES

Surface and subsurface soil samples were collected from six borehole locations on the landfill surface. The soil samples indicate the landfill contains significant concentrations with respect to background concentrations of pesticides/PCBs, TAL metals, SVOCs, and VOCs. Both surface and subsurface soil samples contained significant concentrations with respect to background concentrations of pesticides/PCBs, and TAL metals; however, only SVOCs and VOCs were detected at significant concentrations with respect to background concentrations in the subsurface soil samples.

The collapse of the underground culvert may provide an additional pathway for contaminants to migrate from the site as precipitation may leach through the landfill and enter the hole in the collapsed portion of the pipe. As a result of the constriction of flow through the culvert, during heavy precipitation, a lake forms upgradient of the collapsed portion of the pipe, on the southeast portion of the site. As precipitation continues to fall, the level of the lake rises until the water flows over the surface of the landfill and off the northwest side of the landfill. As the water flows over the side of the landfill, debris and contaminants from the landfill are deposited into Gorst Creek. Additionally, as the level of

the lake rises, water seeps through the landfill and out of the slough area into Gorst Creek. All of these scenarios present the potential of hazardous substance migration from on-site sources into Gorst Creek.

9.2 TARGETS

Target samples consisted of groundwater, surface water, and sediment samples. Target samples contained elevated concentrations with respect to background concentrations of pesticides/PCBs, TAL metals, SVOCs, and VOCs.

The groundwater sample collected from the City of Bremerton monitoring well contained an elevated concentration with respect to background of the TAL metal mercury, and the on-site groundwater sample contained elevated concentrations with respect to background concentrations of two SVOCs (bis[2-ethylhexyl]phthalate and napthalene) and one VOC (total xylenes).

The surface water samples did not contain contaminants at elevated concentrations with respect to background concentrations.

The sediment samples contained elevated concentrations of six pesticides/PCBs (4,4'-DDE; 4,4'-DDT; Aroclor-1254; endrin; endrin ketone; and heptachlor) and three TAL metals (copper, lead, and zinc).

9.3 REMOVAL SUMMARY

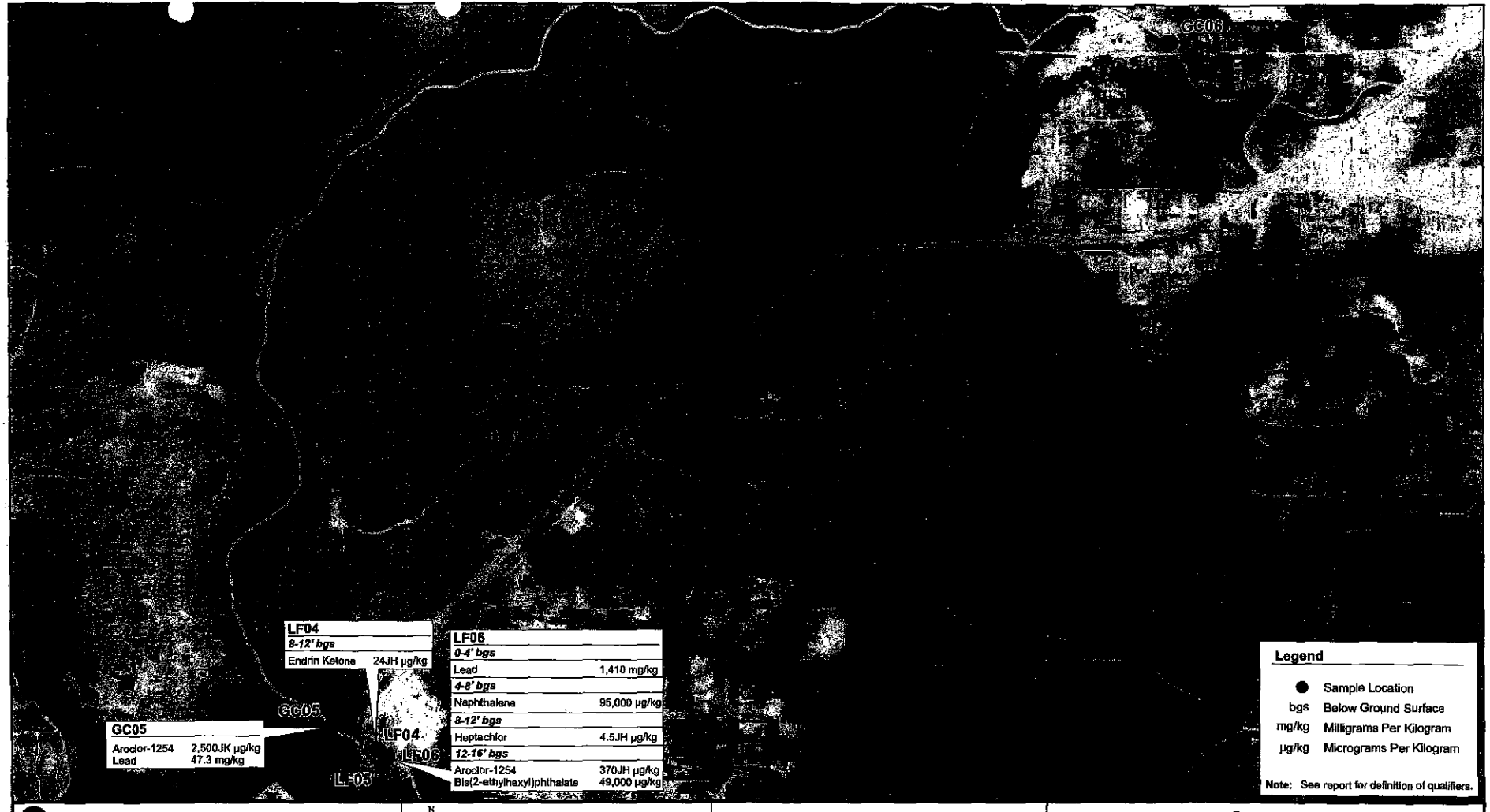
The analytical results for the on-site samples were compared to regulatory benchmarks. Eight pesticides/PCBs (aldrin, alpha-chlordane, Aroclor-1242, Aroclor-1254, dieldrin, endrine ketone, gamma-chlordane, and heptachlor), two TAL metals (arsenic and lead), and four SVOCs (2-methylnaphthalene, bis[2-ethylhexyl]phthalate, naphthalene, and phenanthrene) were detected at concentrations that exceeded regulatory benchmarks in the sediment samples. VOCs were not detected at concentrations that exceeded the site benchmarks in either surface or subsurface soil samples.

The off-site samples also were compared to regulatory benchmarks. Only calcium was detected at concentrations that exceeded the site benchmarks in the surface water samples. Although calcium is an earth crust metal and not generally evaluated based on EPA Region 10 policy, it did exceed the evaluation criteria established for the removal evaluation portion of the project. Five pesticides/PCBs (4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Aroclor-1254, and endrin) and four TAL metals (copper, lead, nickel, and zinc) were detected at concentrations that exceeded regulatory benchmarks in the sediment samples. In addition, nickel exceeded regulatory benchmarks in all five sediment samples.

9.4 CONCLUSIONS

Results of the IA indicate that the Gorst Creek - Bremerton Auto Wrecking Landfill site is a source of hazardous substance contamination, including pesticides/PCBs, TAL metals, SVOCs, and VOCs. Two Federal-listed threatened species are subject to actual contamination based on sediment results. The IA documented that contaminants have been and continue to be released to Gorst Creek. This contamination also could potentially impact nearby groundwater wells, sport fisheries, the tribal fish-rearing facility, wetlands, and other sensitive environments in Gorst Creek and Sinclair Inlet.

Figure 9-1 presents the analytes that were detected at elevated concentrations and exceeded a site benchmark in target samples, and which also were detected at significant concentrations and exceeded a site benchmark in source samples. Additionally, for comparison, the figure show the highest concentration of analytes detected in source samples that had both significant concentrations and exceeded a site benchmark..



ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

Map Reference: USGS Digital OrthoPhoto Quarter Quadrangle - Bremerton West, July 7, 1994

Gorst Creek - Bremerton Auto Wrecking Landfill
Integrated Assessment
Port Orchard, Washington

Figure 9-1
SUMMARY SAMPLE CONCENTRATION MAP

Date:	Drawn by:	Job Number:
02/12/2004	avh	001281.0291.01IA

10. REFERENCES

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———, 1997f, *Poulsbo, Washington Quadrangle*, 7.5-minute series National Wetland Inventory map.

———, 1997g, *Suquamish, Washington Quadrangle*, 7.5-minute series National Wetland Inventory map.

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APPENDIX A
SAMPLE PLAN ALTERATION FORMS

Sample Plan Alteration Form

Project Name and TDD No.: Gorst Creek - Bremerton Auto Wrecking Landfill: 03-07-0009

Material to be Sampled: Groundwater

Measurement Parameter: Not Applicable

Standard Procedure for Field Collection and Laboratory Analysis (cite reference): Not Applicable

Reason for Change in Field Procedure or Analysis Variation: Access to the two nearby domestic groundwater wells could not be obtained.

Variation from Field or Analytical Procedure: No samples were collected from the wells.

Special Equipment, Materials, or Personnel Required: Not applicable

Initiator's Name: Renee L Mordeen Date: 5/28/04

Project Manager: Renee L Mordeen Date: 5/28/04

QA Officer: Mark Woodle Date: 5-28-04

Sample Plan Alteration Form

Project Name and TDD No.: Gorst Creek - Bremerton Auto Wrecking Landfill: 03-07-0009

Material to be Sampled: Subsurface soil

Measurement Parameter: Not applicable

Standard Procedure for Field Collection and Laboratory Analysis (cite reference): Not applicable

Reason for Change in Field Procedure or Analysis Variation: Sample recovery from borehole samples was insufficient to fill all samples containers. Below is a list of the samples and the analytical suites that were not completed.

Variation from Field or Analytical Procedure: LF01SB12 (SVOCs), LV04SB12 (SVOCs and TAL Metals), LF04SB20 (SVOCs and TAL Metals), LF06SB16 (TAL Metals and VOCs), and LF06GW (TAL Metals).

Special Equipment, Materials, or Personnel Required: Not applicable

Initiator's Name: Renee L. Mordeen Date: 5/28/04

Project Manager: Renee L. Mordeen Date: 5/28/04

QA Officer: Mark Riedel Date: 5-28-04

APPENDIX B

PHOTOGRAPHIC DOCUMENTATION

PHOTOGRAPH IDENTIFICATION SHEET

Camera Serial No. 897924 **TDD No. 03-07-0009**

Lens Type: 35 mm **Site Name: Gorst Creek - Bremerton Auto Wrecking Landfill**

Photo No.	Date	Time	By	Dir.	Description
1-1	11/10/03	1225	JF	Down	Surface soil sample LF01SS collected from Borehole LF01.
1-2	11/10/03	1245	JF	Down	Subsurface soil sample LF01SB04 collected from Borehole LF01.
1-3	11/10/03	1325	JF	Down	Subsurface soil sample LF01SB08 collected from Borehole LF01.
1-4	11/10/03	1330	JF	Down	Subsurface soil sample LF01SD12 collected from Borehole LF01.
1-5	11/10/03	1400	JF	Down	View of subsurface materials from LF01 16 to 20 feet below ground surface (no sample was collected from this depth).
1-6	11/10/03	1420	JF	Down	Surface soil sample LF02SS collected from Borehole LF02.
1-7	11/10/03	1422	JF	E	Locations of Borehole LF02.
1-8	11/10/03	1425	JF	Down	Subsurface soil sample LF02SB04 collected from Borehole LF02.
1-9	11/10/03	1435	JF	Down	Subsurface soil sample LF02SB08 collected from Borehole LF02.
1-10	11/10/03	1445	JF	Down	Subsurface soil sample LF02SB12 collected from Borehole LF02.
1-11	11/10/03	1500	JF	Down	Subsurface soil sample LF02SB16 collected from Borehole LF02.
1-12	11/10/03	1510	JF	Down	Subsurface soil sample LF02SB20 collected from Borehole LF02.
1-13	11/11/03	0940	JF	Down	Surface soil sample LF03SS (note white board incorrectly indicates LF01SS, and time is incorrectly noted as 1040) collected from Borehole LF03.
1-14	11/11/03	1000	JF	Down	Subsurface soil sample LF03SB04 collected from Borehole LF03 (note time is incorrectly noted at 1040).
1-15	11/11/03	1010	JF	W	Location of Borehole LF02.
1-16	11/11/03	1020	JF	Down	Subsurface soil sample LF03SB08 collected from Borehole LF03.
1-17	11/11/03	1105	JF	Down	Subsurface soil sample LF03SB12 collected from Borehole LF03.
1-18	11/11/03	1125	JF	Down	Subsurface soil sample LF03SB16 collected from Borehole LF03.
1-19	11/11/03	1150	JF	Down	Subsurface soil sample LF03SB20 collected from Borehole LF03.
1-20	11/11/03	1315	JF	S	Location of Borehole LF04.
1-21	11/11/03	1320	JF	Down	Surface soil sample LF04SS collected from Borehole LF04.
1-22	11/11/03	1330	JF	Down	Subsurface soil sample LF04SB04 collected from Borehole LF04.
1-23	11/11/03	1340	JF	Down	Subsurface soil sample LF04SB08 collected from Borehole LF04.
1-24	11/11/03	1350	JF	Down	Subsurface soil sample LF04SB12 collected from Borehole LF04.
2-1	11/11/03	1400	JF	Down	Subsurface soil sample LF04SB16 collected from Borehole LF04.
2-2	11/11/03	1410	JF	Down	Subsurface soil sample LF04SB20 collected from Borehole LF04.
2-3	11/12/03	0930	JF	Down	Surface soil sample LF05SS collected from Borehole LF05.
2-4	11/12/03	0940	JF	Down	Subsurface soil sample LF05SB04 collected from Borehole LF05.
2-5	11/12/03	0950	JF	Down	Subsurface soil sample LF05SB08 collected from Borehole LF05.
2-6	11/12/03	0955	JF	E	Location of Borehole LF05.
2-7	11/12/03	1000	JF	Down	Subsurface soil sample LF05SB12 collected from Borehole LF05.
2-8	11/12/03	1020	JF	Down	Subsurface soil sample LF05SB16 collected from Borehole LF05.
2-9	11/12/03	1040	JF	Down	Subsurface soil sample LF05SB20 collected from Borehole LF05.
2-10	11/12/03	1110	JF	E	Location of Borehole LF06.
2-11	11/12/03	1125	JF	Down	Surface soil sample LF06SS.
2-12	11/12/03	1130	JF	Down	Subsurface soil sample LF06SB04 collected from Borehole LF06.

PHOTOGRAPH IDENTIFICATION SHEET

Camera Serial No. 897924 **TDD No. 03-07-0009**

Lens Type: 35 mm **Site Name: Gorst Creek - Bremerton Auto Wrecking Landfill**

Photo No.	Date	Time	By	Dir.	Description
2-13	11/12/03	1135	JF	Down	Subsurface soil sample LF06SB08 collected from Borehole LF06.
2-14	11/12/03	1140	JF	Down	Subsurface soil sample LF06SB12 collected from Borehole LF06.
2-15	11/12/03	1150	JF	Down	Subsurface soil sample LF06SB16 collected from Borehole LF06.
2-16	11/12/03	1200	JF	S	Peristaltic pump collecting groundwater sample LF06GW from Borehole LF06.
2-17	11/12/03	1345	JF	Down	Surface soil sample BG01SS collected from the Airport Auto Wrecking, Too parking lot.
2-18	11/12/03	1350	JF	Down	Subsurface soil sample BG01SB04 collected from the Airport Auto Wrecking, Too parking lot.
Note: This role of film was damaged in the field and not able to be processed. The information is provided for the descriptions.					
3-1	11/10/03	1048	BM	W	E & E purging City of Bremerton monitoring well BR-11, location of groundwater sample MW01GW.
3-2	11/10/03	1210	BM	W	Groundwater sample MW01GW.
3-3	11/10/03	1531	BM	N	E & E purging City of Bremerton monitoring well BR-9, location of background groundwater sample BG01GW.
3-4	11/10/03	1609	BM	N	Background groundwater sample BG01GW.
3-5	11/11/03	1000	BM	NW	Surface water sample GC03SW collected from PPE 1 on Gorst Creek.
3-6	11/11/03	1008	BM	NW	Sediment sample GC03SD collected from PPE 1 on Gorst Creek.
3-7	11/10/03	1014	BM	NW	Sediment sample GC03SD collected from PPE 1 on Gorst Creek.
3-8	11/11/03	1038	BM	W	Sediment sample GC02SD collected from high water mark upgradient of PPE 1 on Gorst Creek
3-9	11/11/03	1216	BM	N	Surface water sample BG02SW collected from headwaters of Gorst Creek.
3-10	11/11/03	1224	BM	N	Sediment sample BG03SD collected from headwaters of Gorst Creek.
3-11	11/11/03	1331	BM	NW	Sediment sample GC05SD collected downstream of PPE 2 on Gorst Creek.
3-12	11/11/03	1424	BM	S	Surface water sample GC04SW collected from PPE 2 on Gorst Creek.
3-13	11/11/03	1432	BM	S	Sediment sample GC04SD collected from PPE 2 on Gorst Creek.
3-14	11/12/03	1638	BM	S	Chum salmon in Gorst Creek near fish rearing facility.
3-15	11/12/03	1639	BM	S	Chum salmon in Gorst Creek near fish rearing facility.
3-16	11/12/03	1641	BM	Down	Sediment sample GC06SD collected downstream of fish rearing facility on Gorst Creek.
3-17	11/12/03	16465	BM	N	Location of sediment sample GC06SD downstream of fish rearing facility on Gorst Creek.

Key:

BM = Ben Martich.
E = East.
E & E = Ecology and Environment, Inc.
JF = Jeffrey Fowlow.
mm = Millimeter.
N = North.
No. = Number.
PPE = Probable Point of Entry.
S = South.
TDD = Technical Direction Document.
W = West.


Gorst Creek
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11/10/03 1225
LF01SS
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Creek
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LFØ1SBØ4
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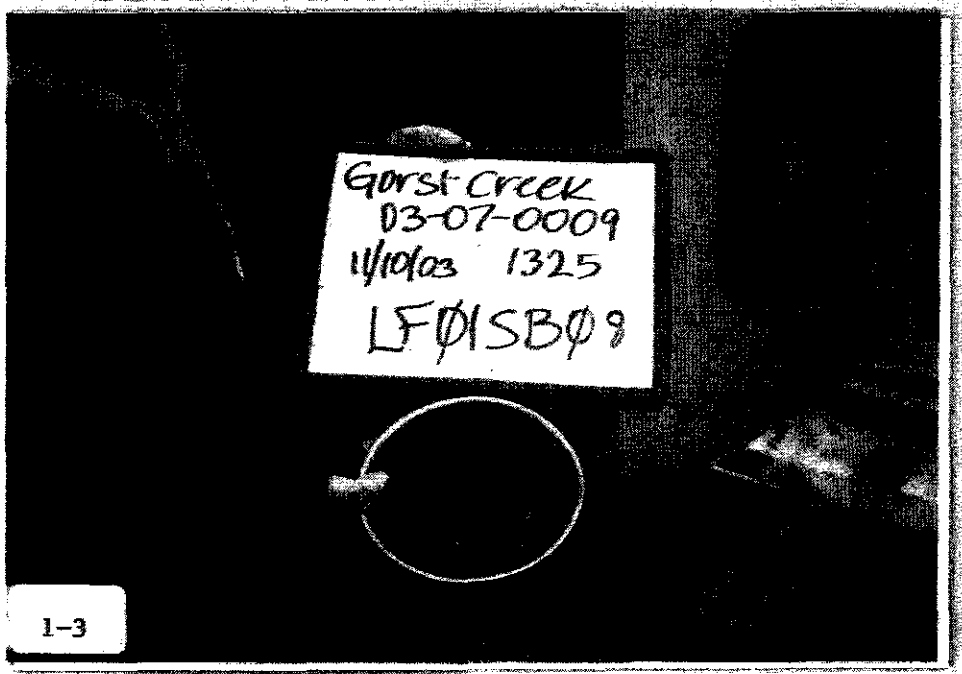
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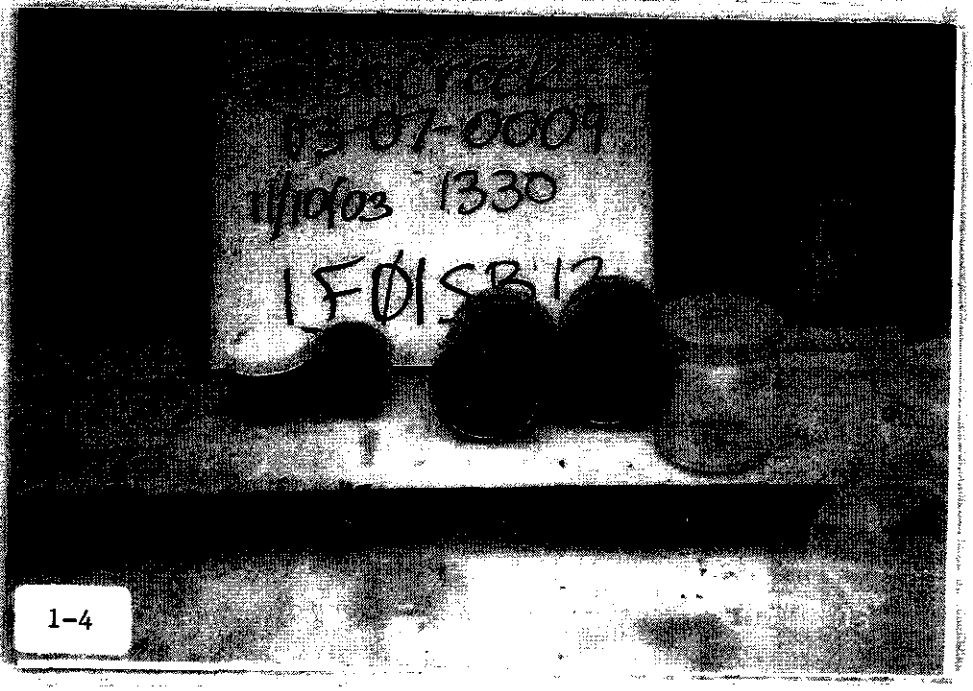
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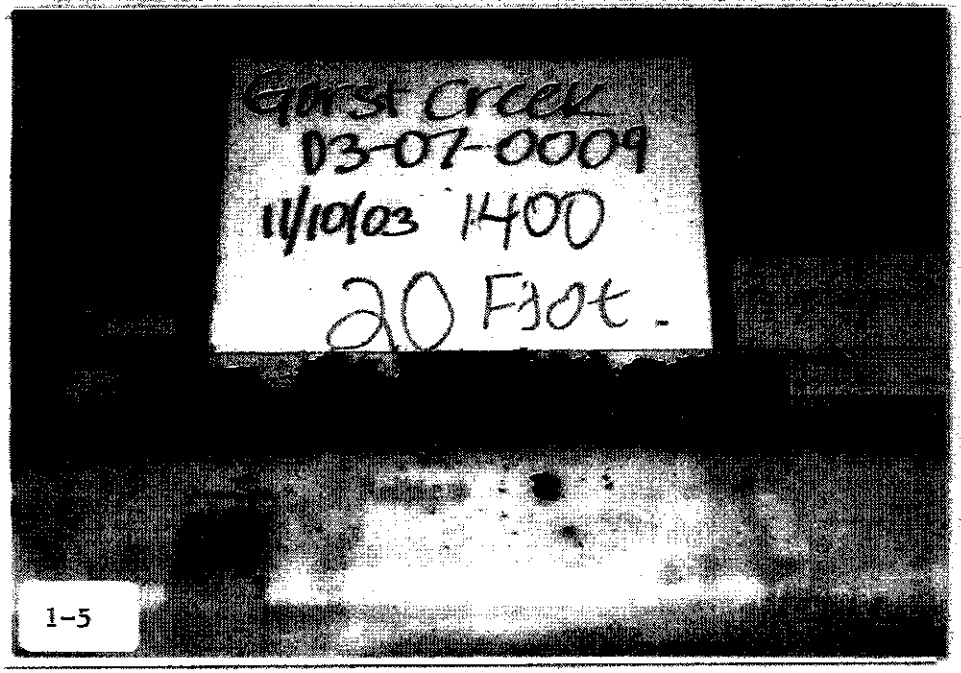
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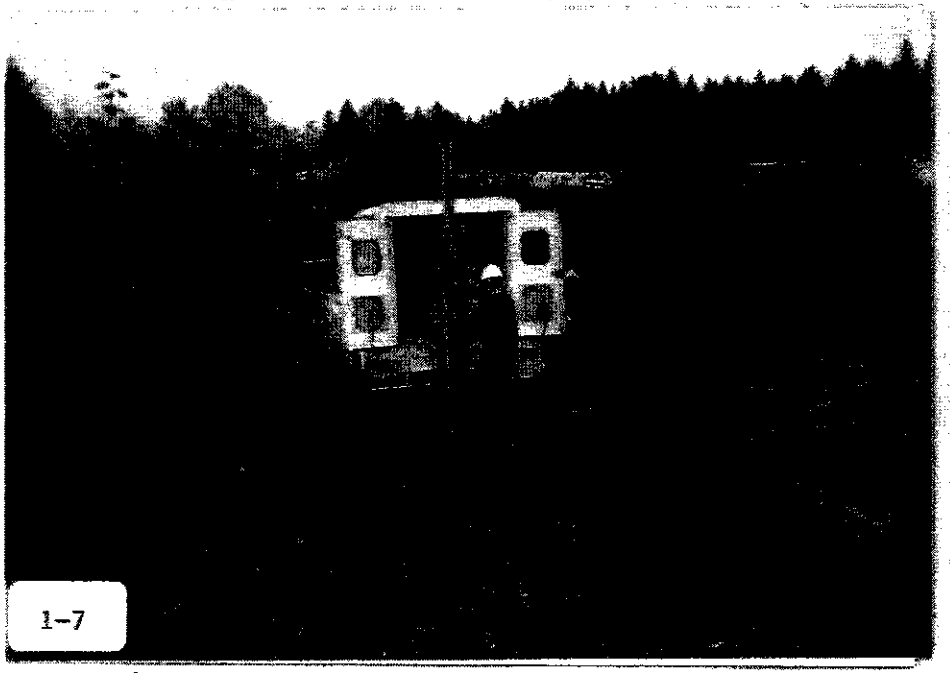
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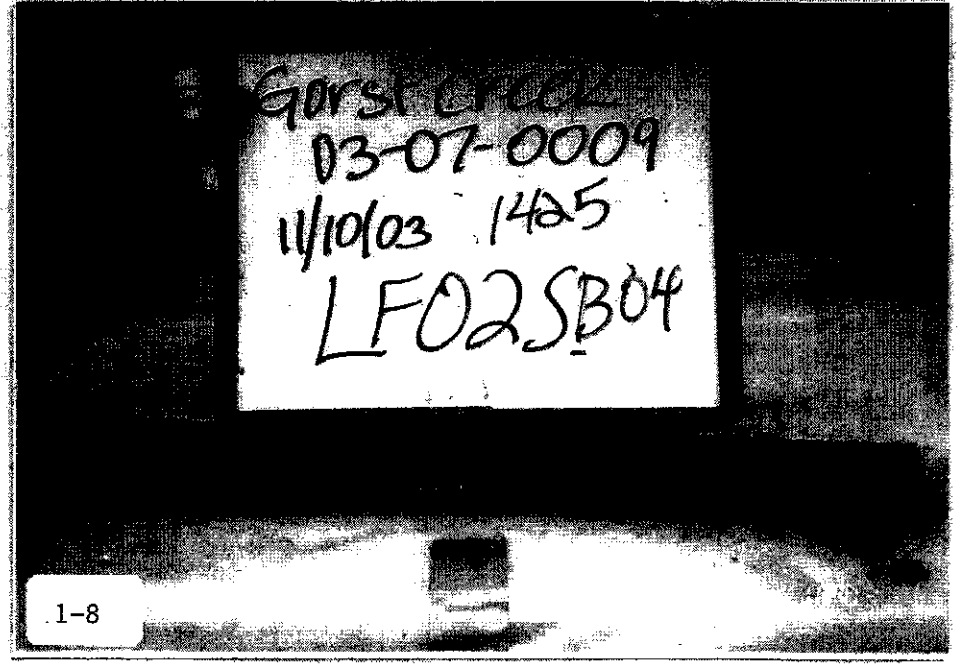
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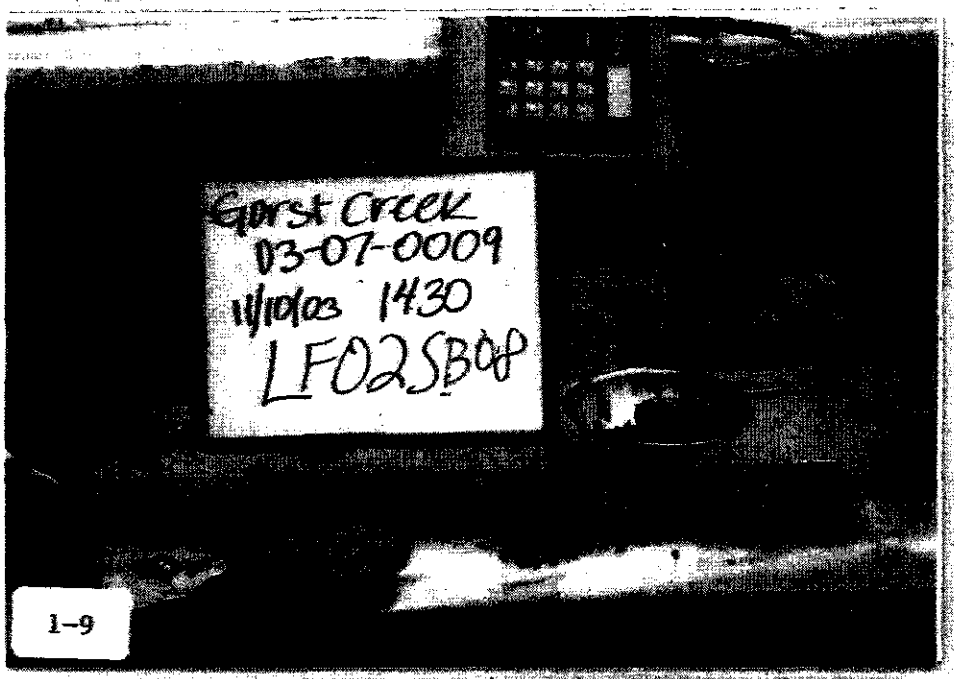

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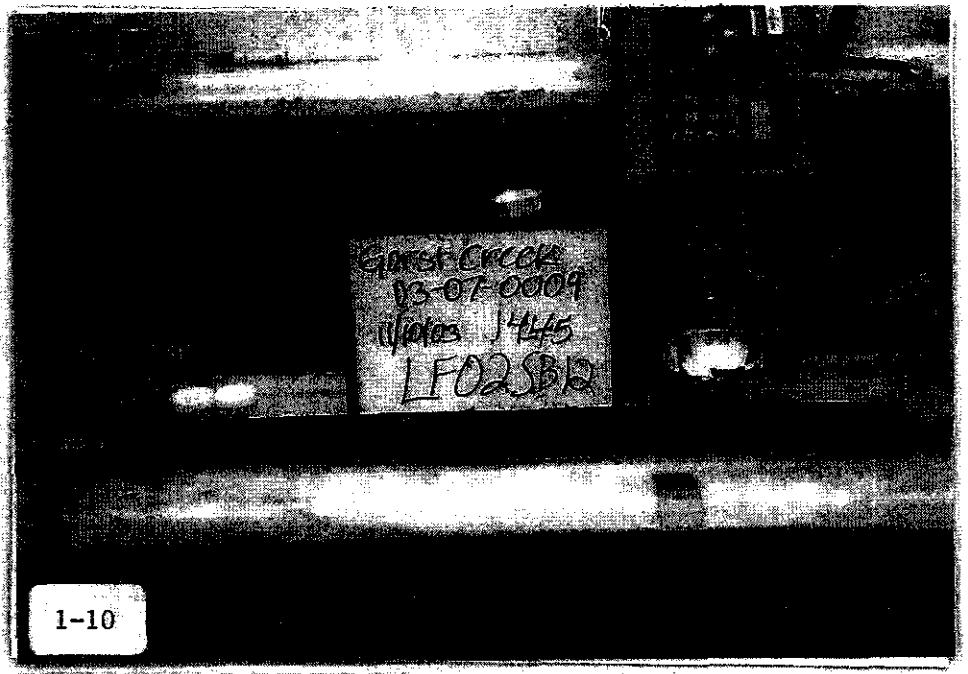

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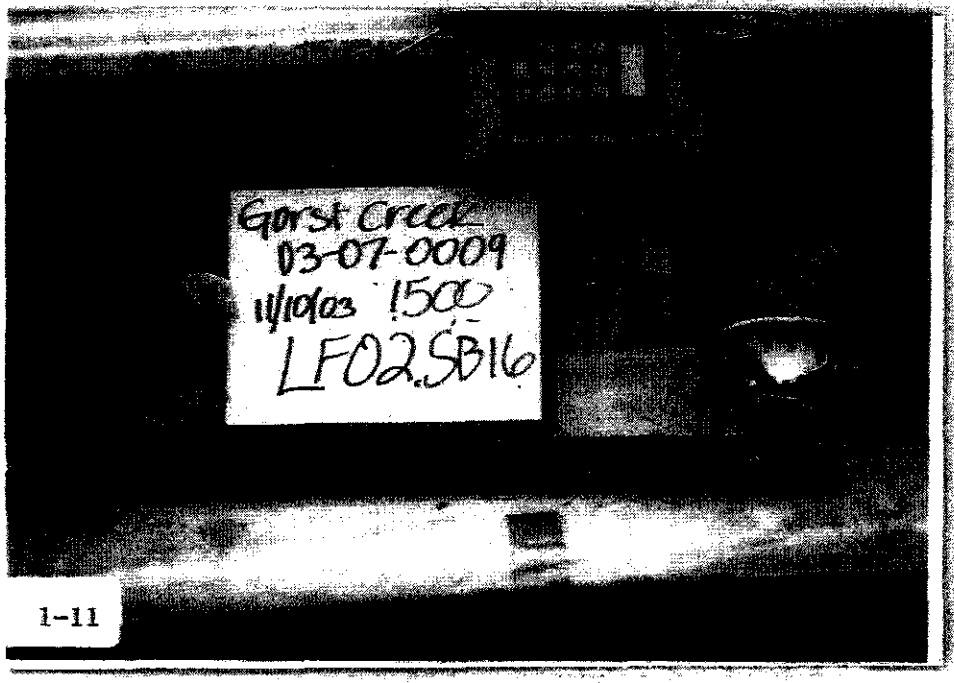

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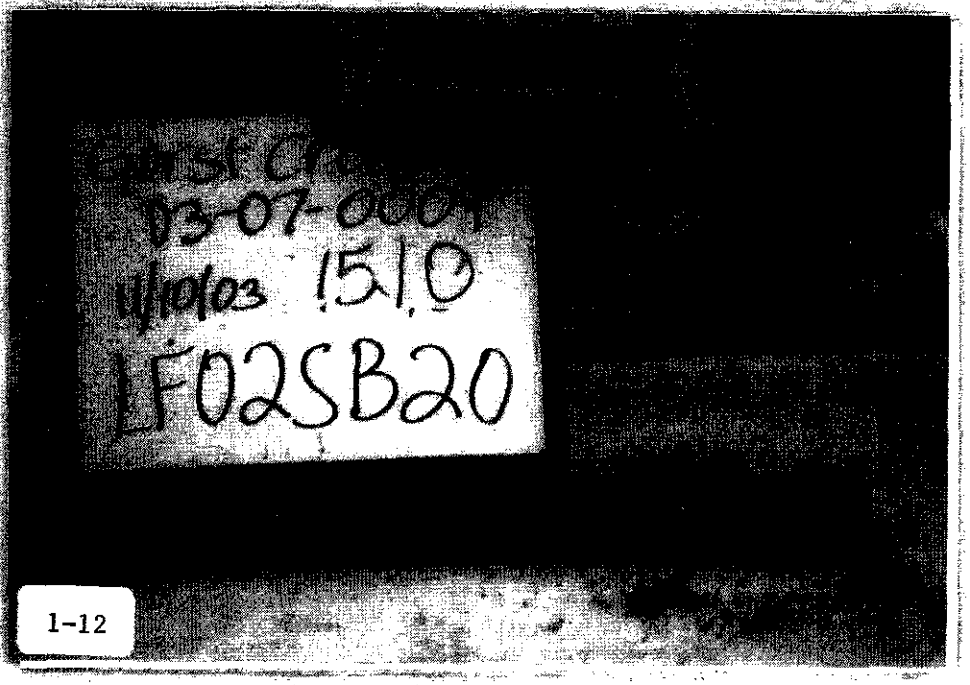

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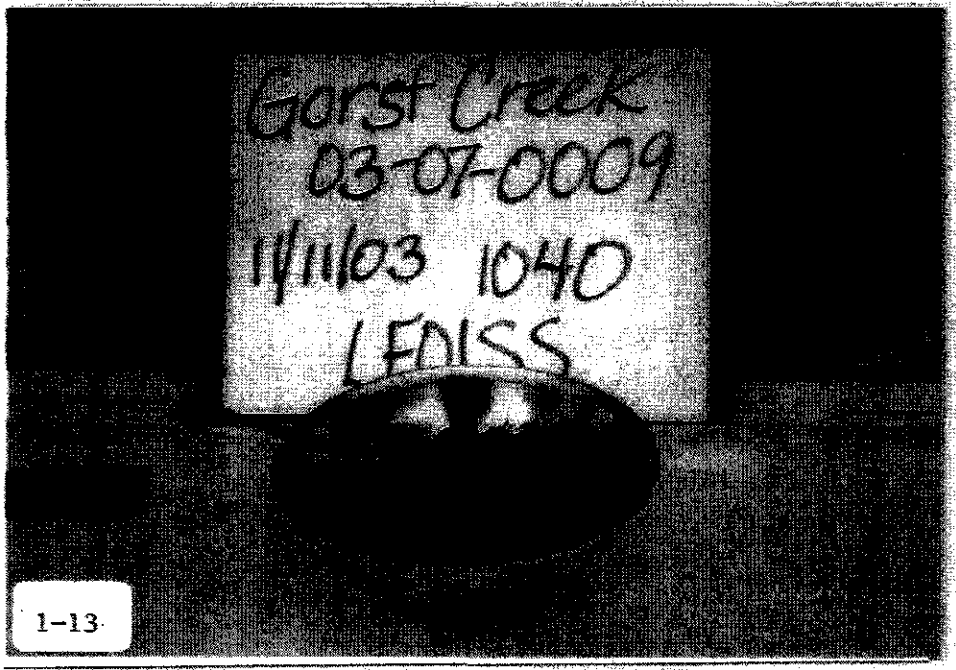
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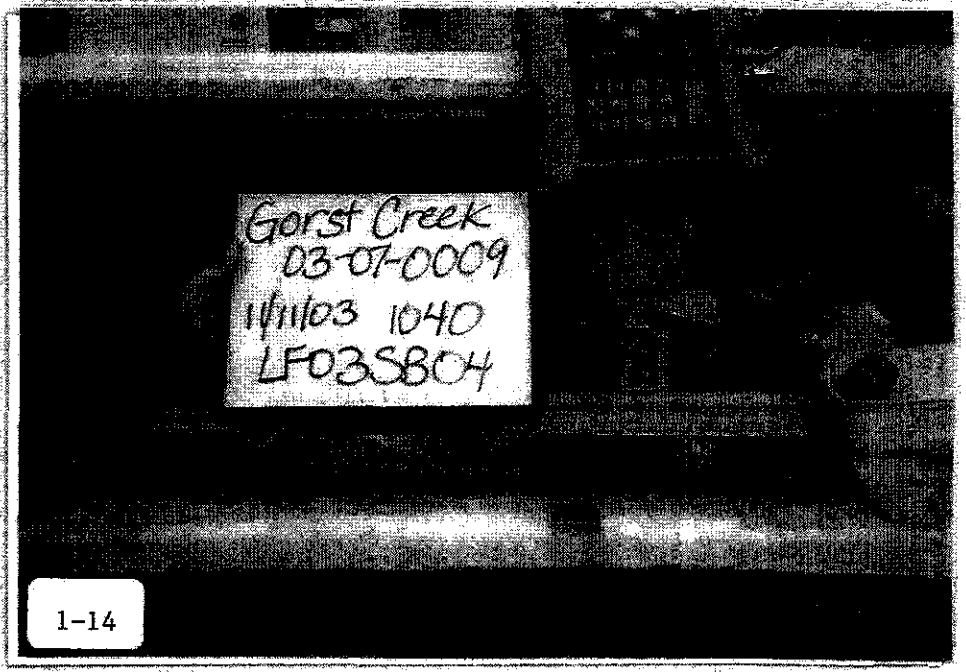
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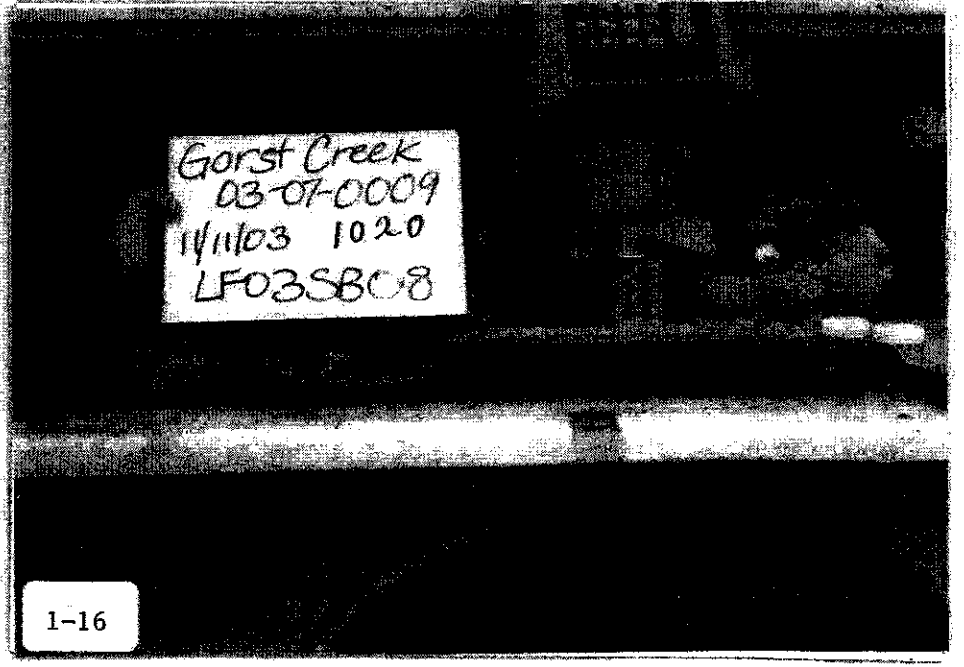
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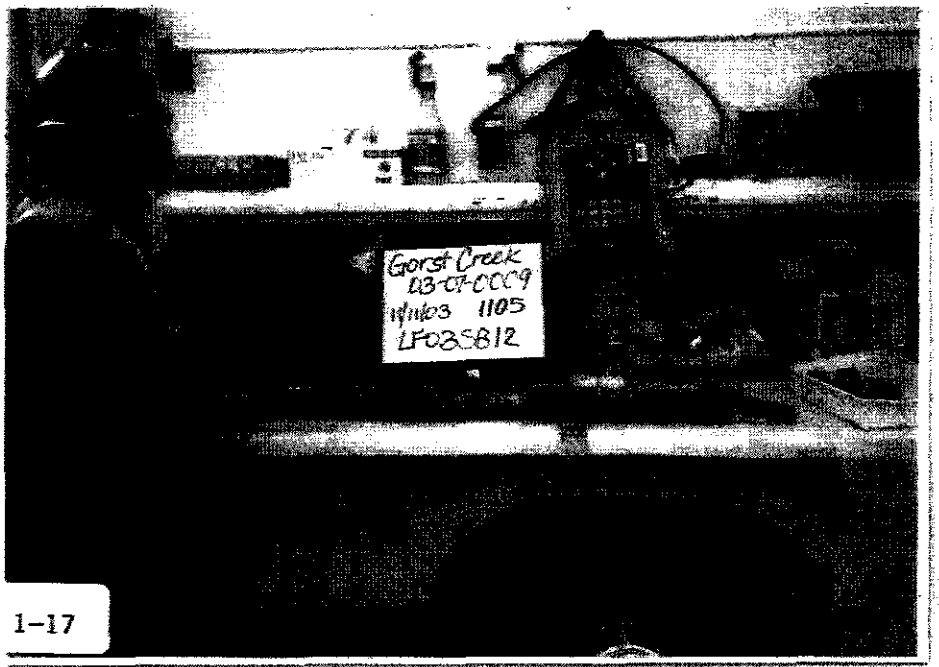

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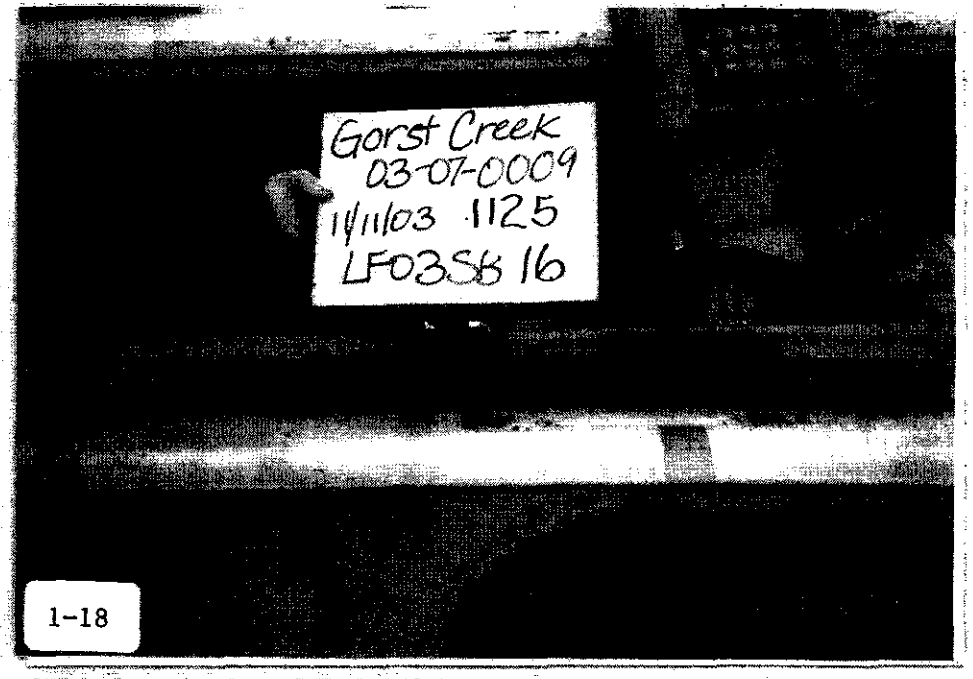

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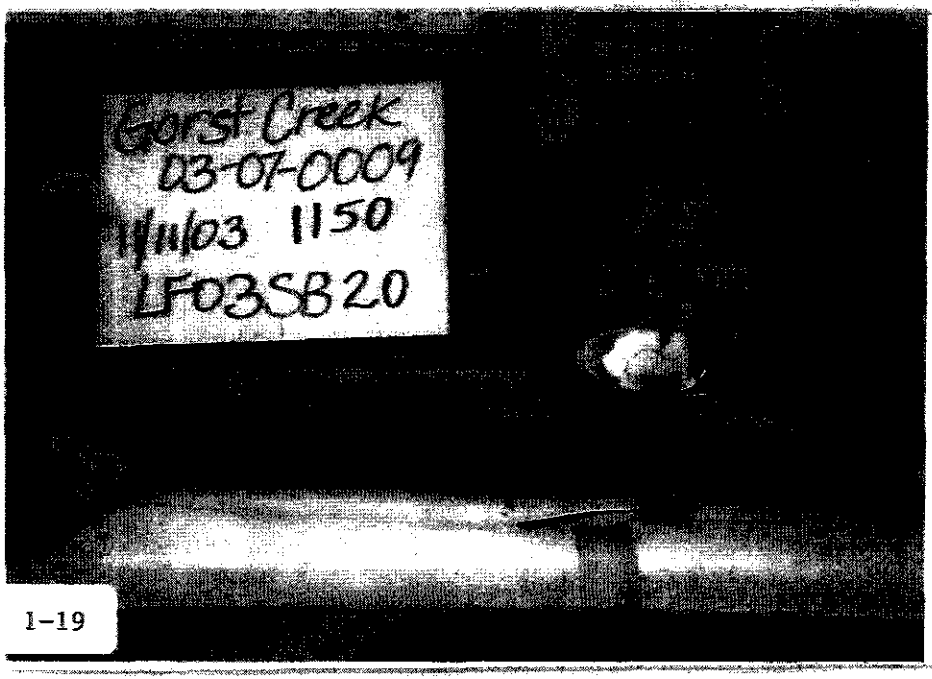

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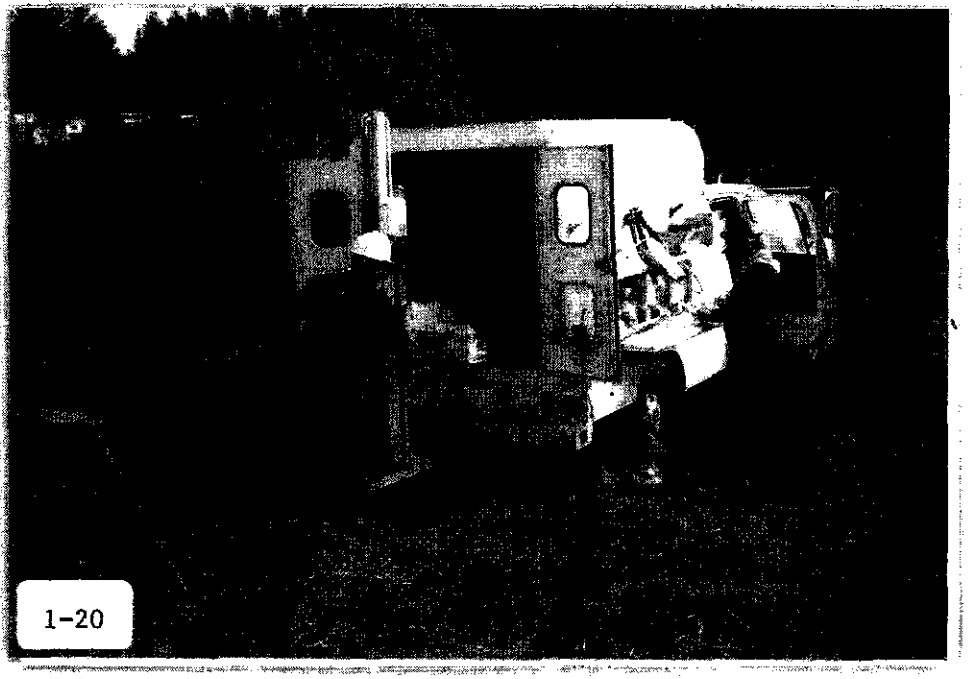

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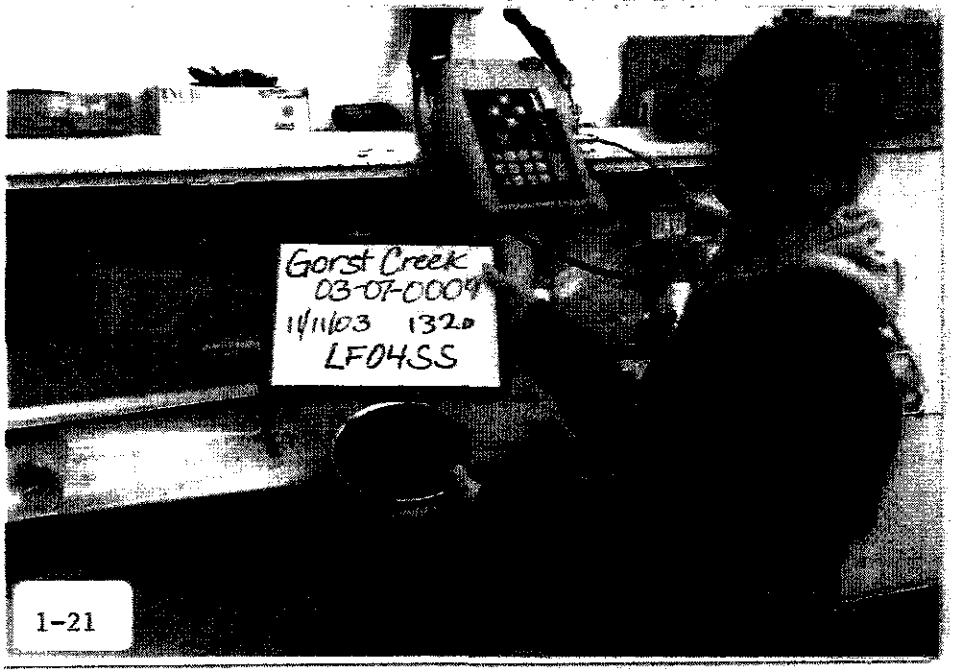

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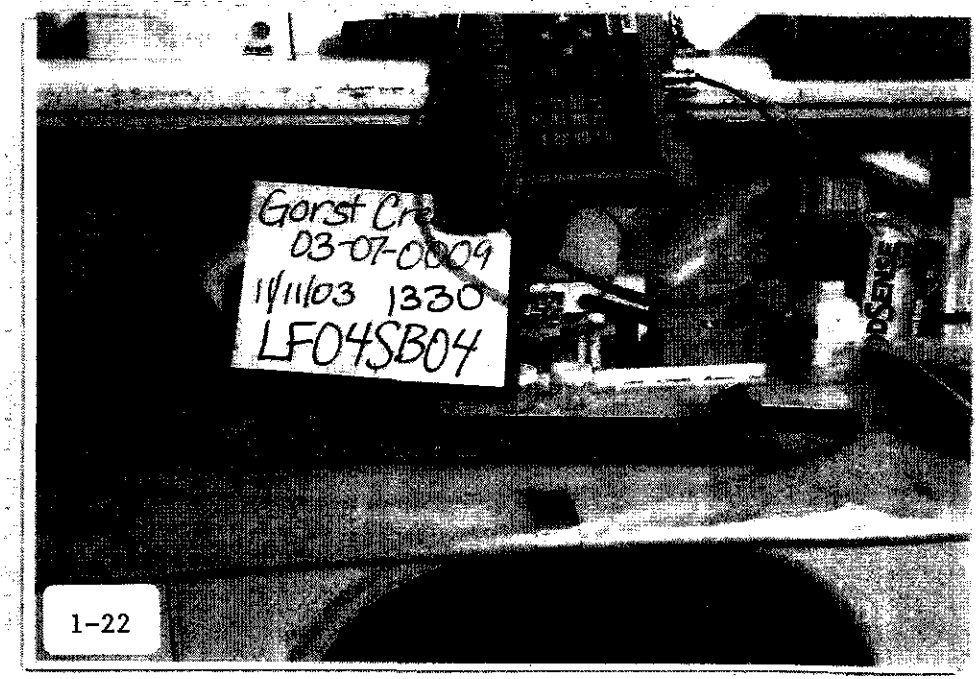

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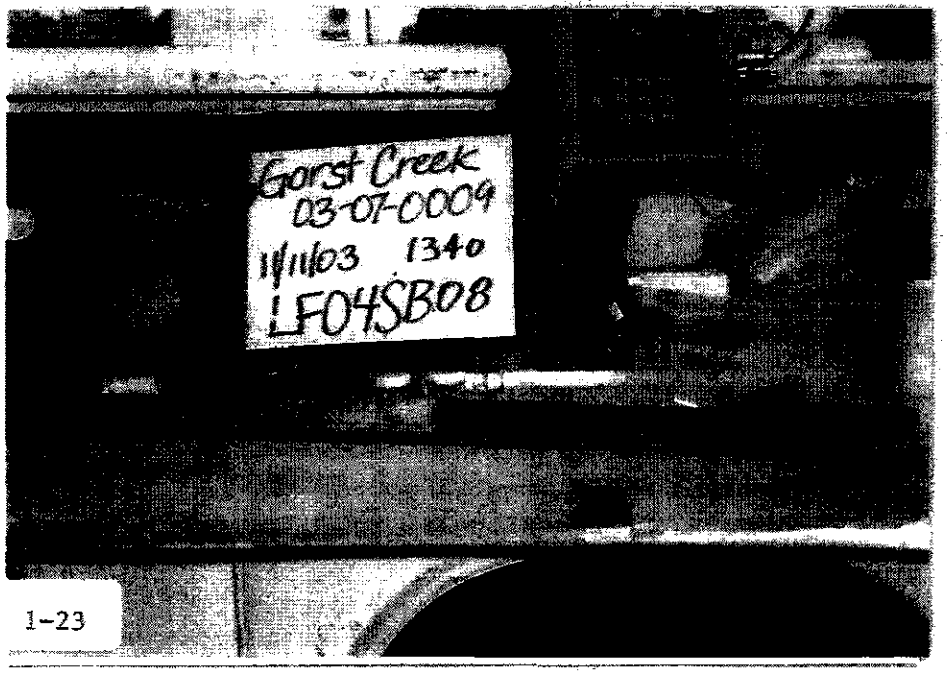

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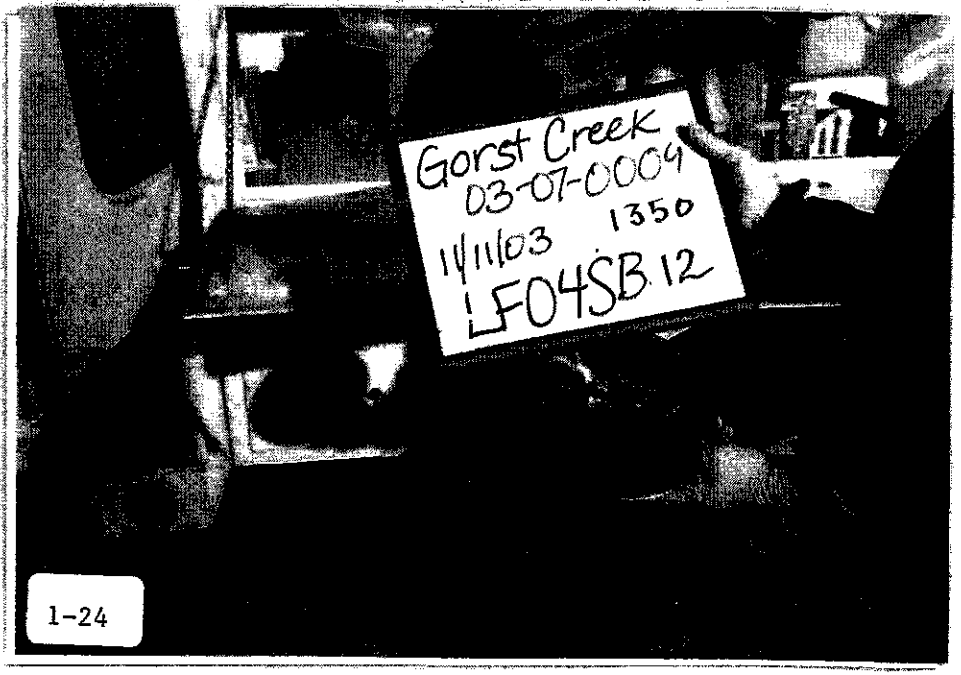

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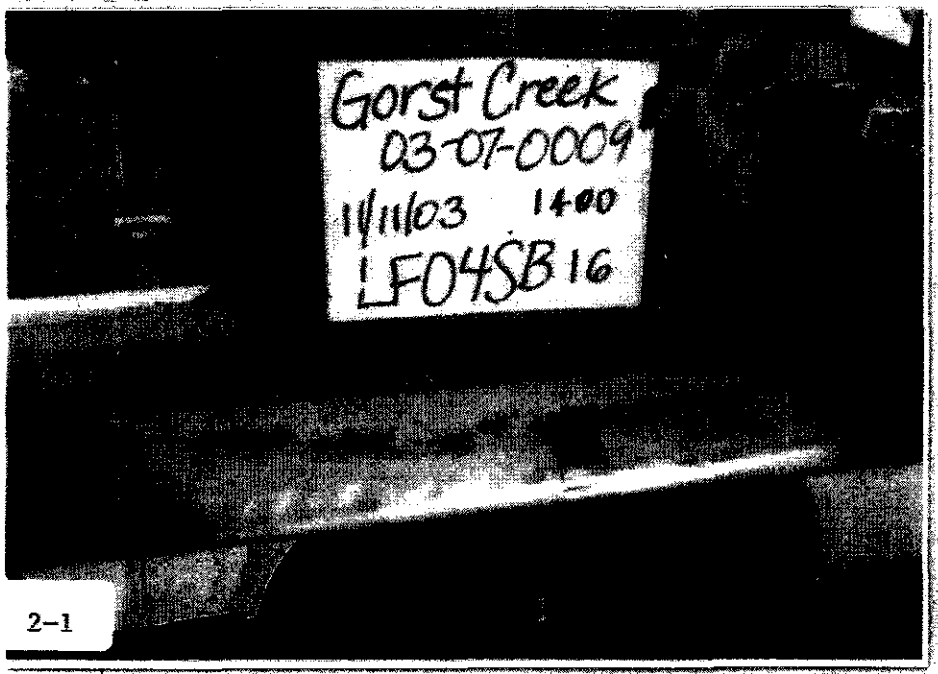
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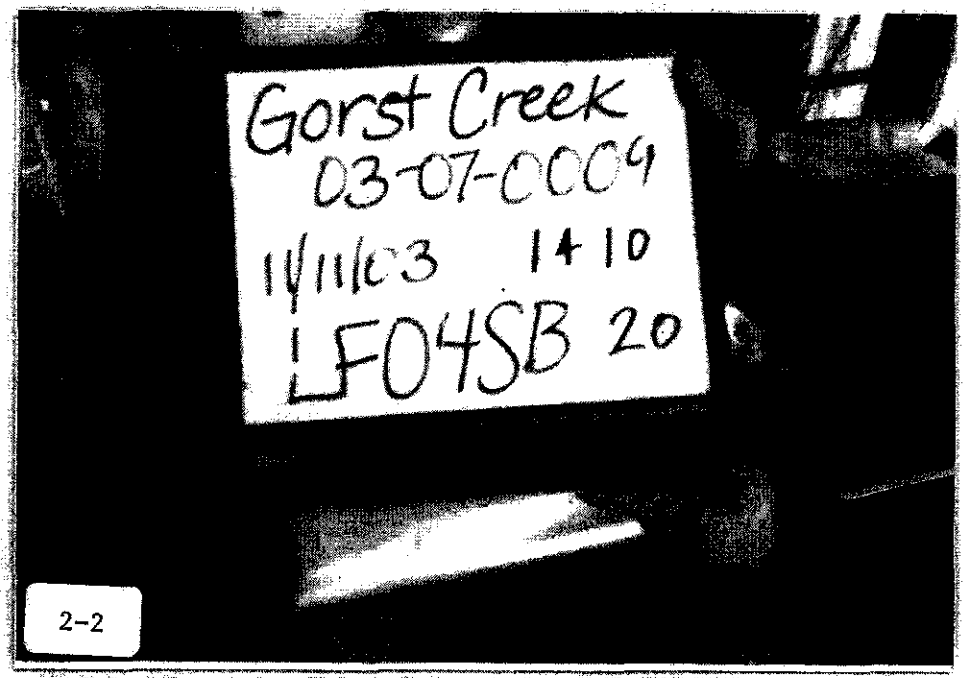
03-07-0009
11/11/03 1400
LF04SB16

2-1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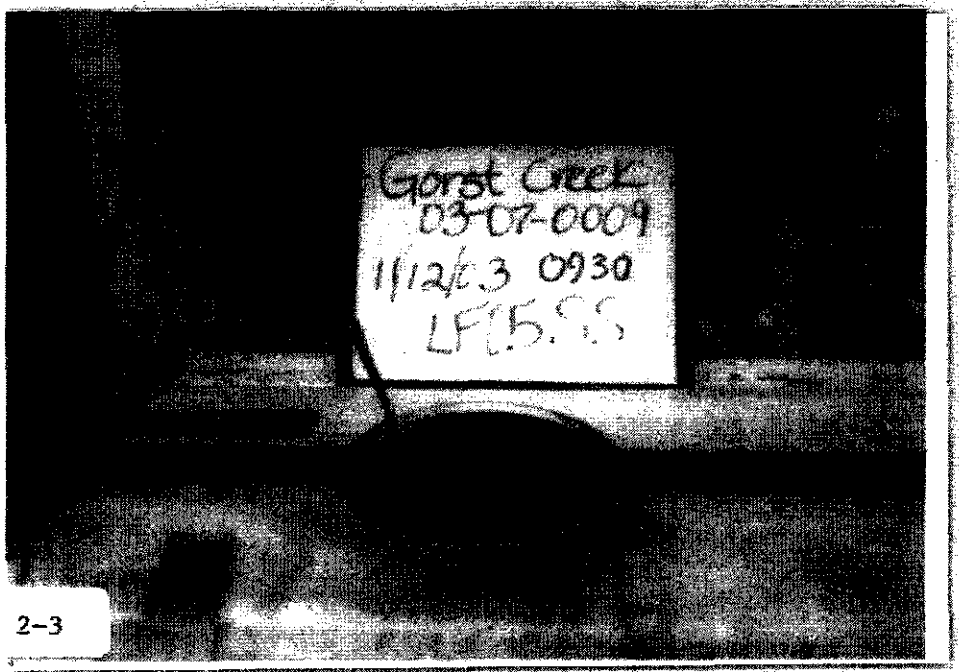
03-07-0009
11/11/03 1410
LF04SB 20

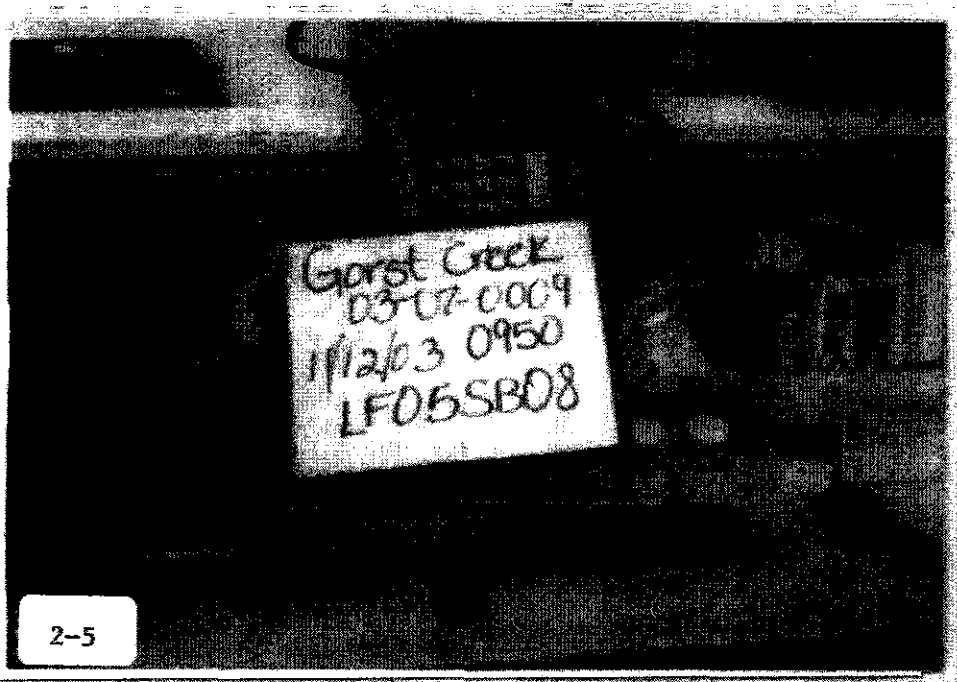
2-2


Gorst Creek
03-07-0009
11/12/03 0930

2-3


Gorst Creek
03-07-0009
11/12/03 0940
LF05SB04

2-4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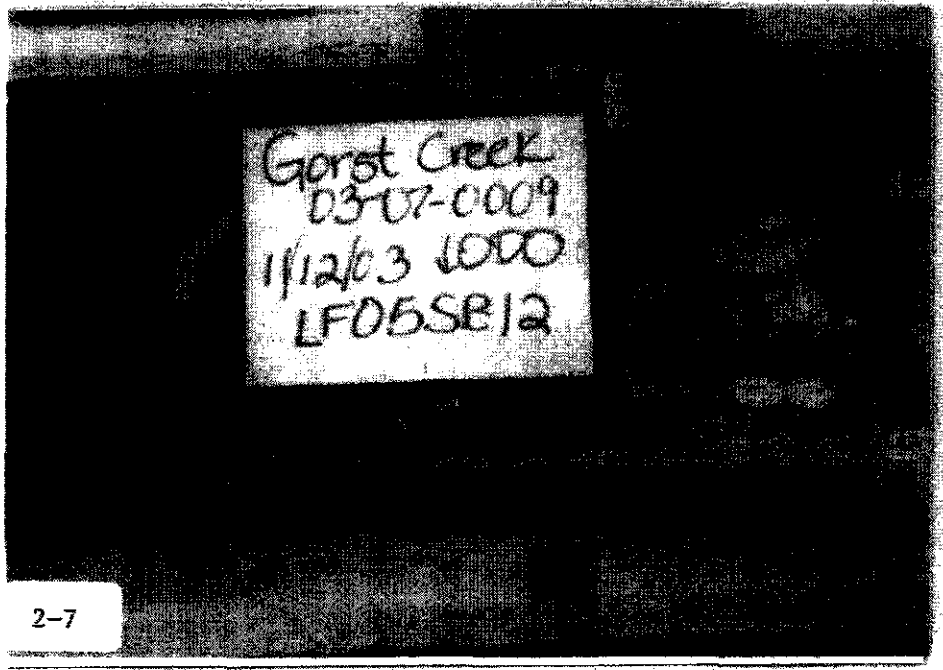
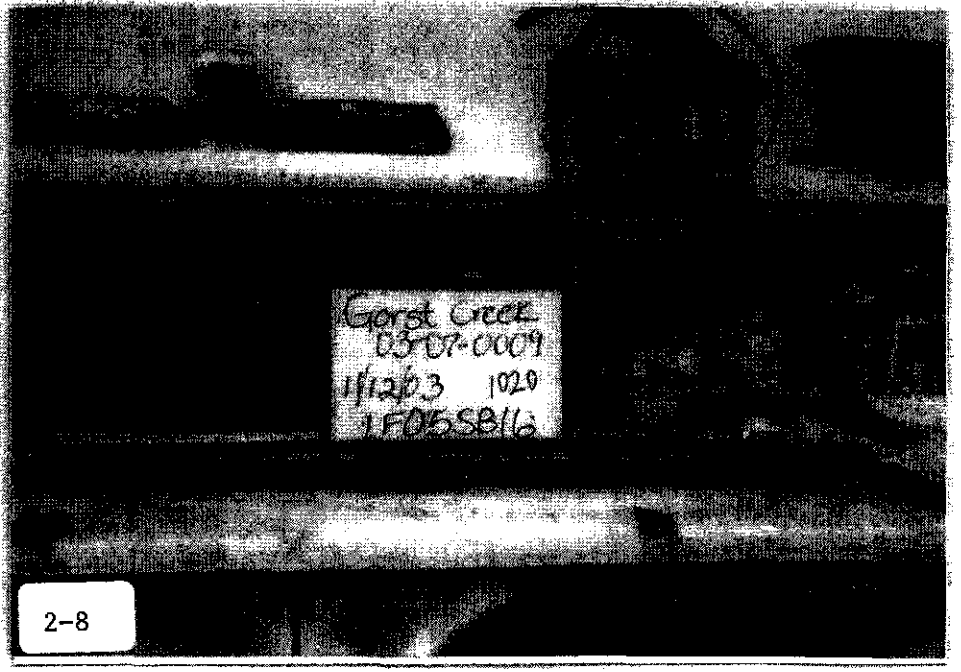
03-07-0009
11/12/03 0950
LF05SB08

2-5

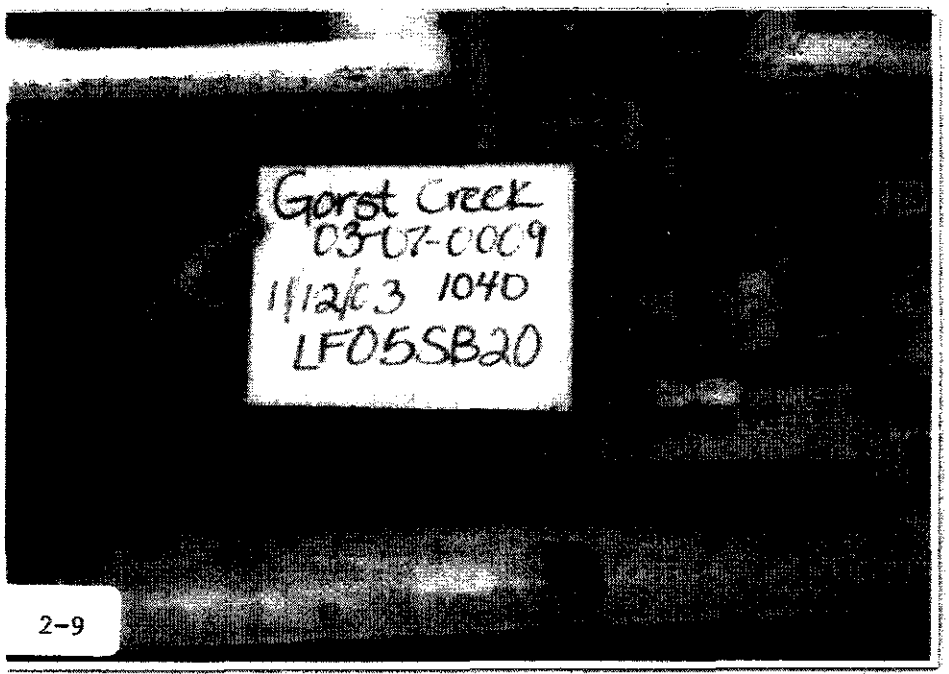
2-6


Gorst Creek
03-07-0009
11/12/03 1000
LF05SB12

2-7


Gorst Creek
03-07-0009
11/12/03 1020
LF05SB16

2-8



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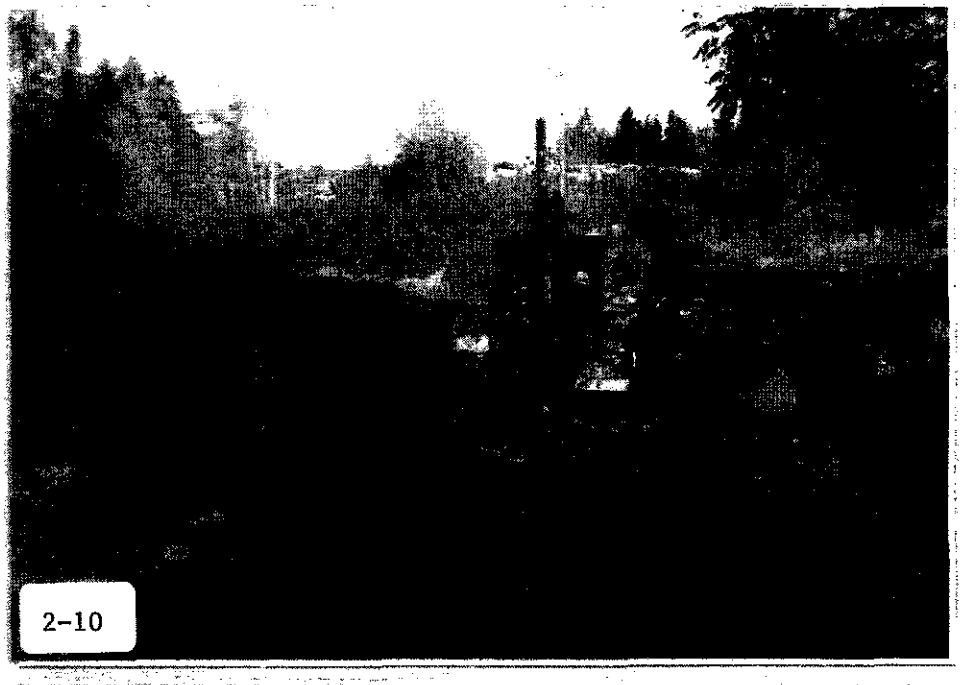

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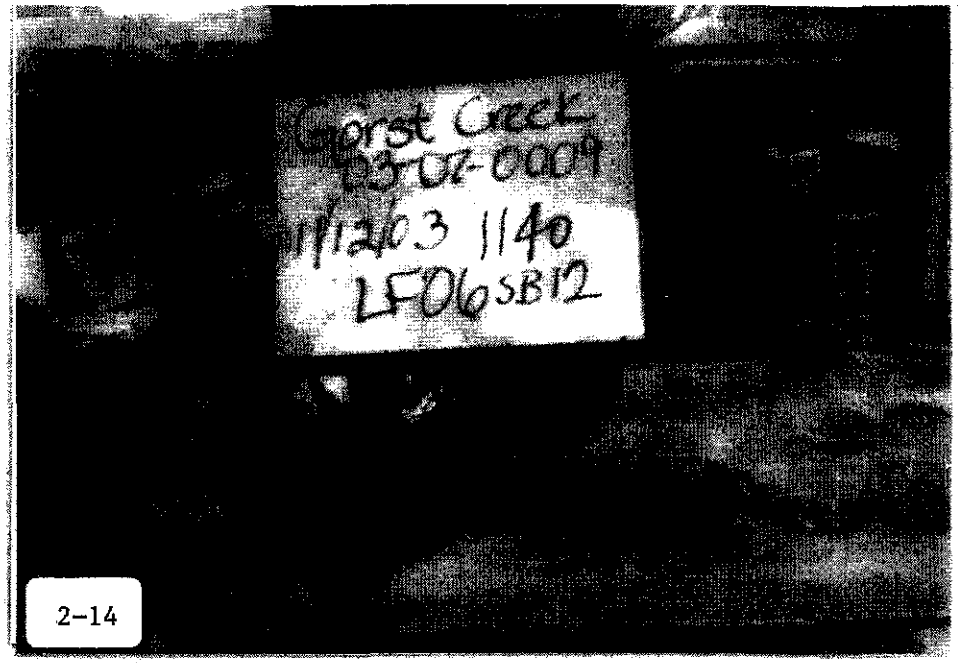
2-11

2-12

2-13



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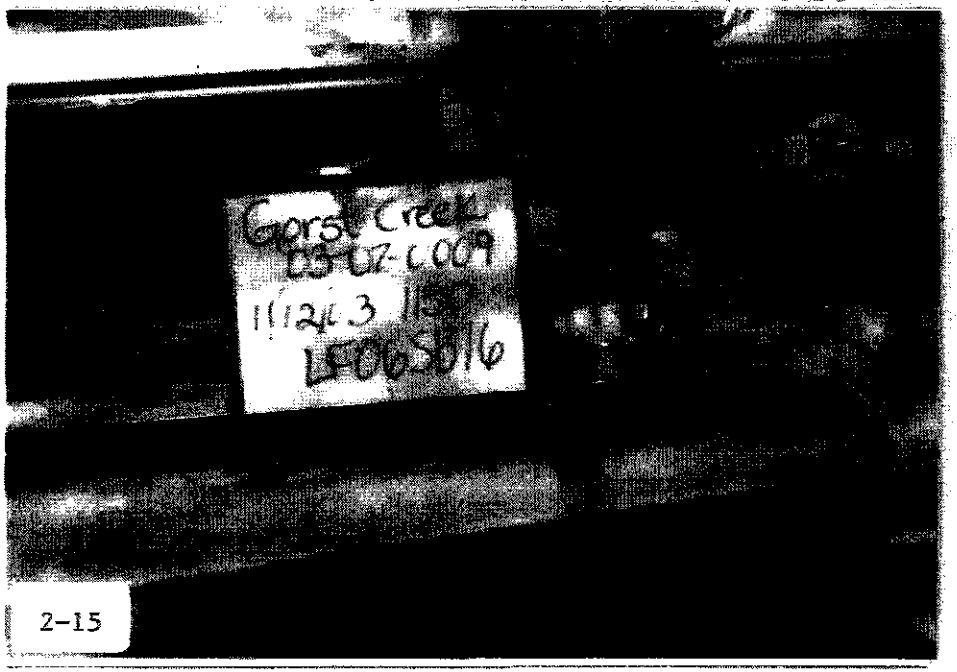

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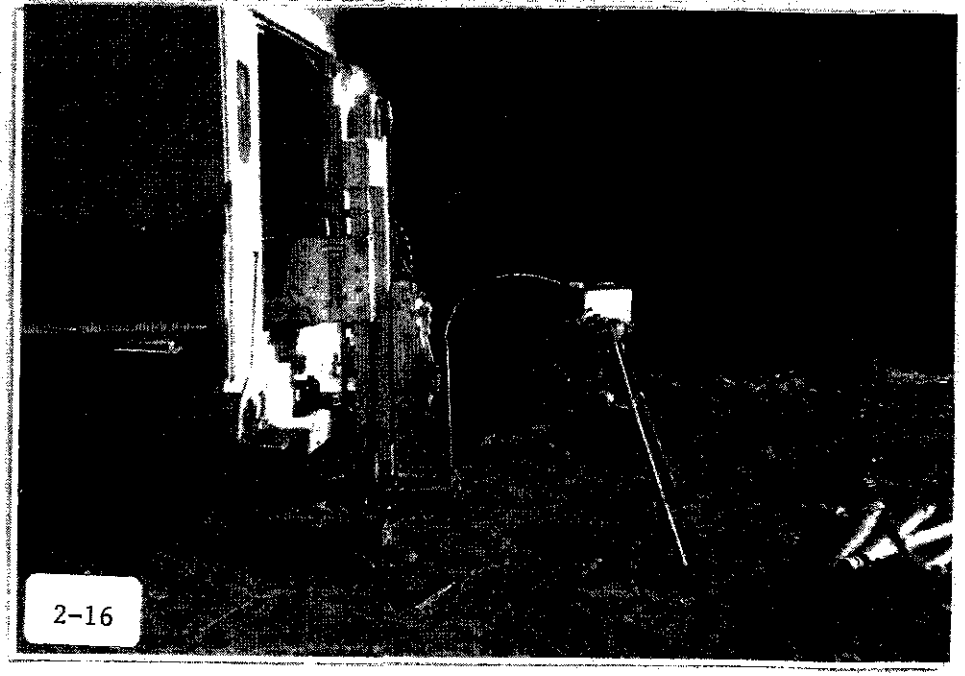

2-16

2-17

2-18

APPENDIX C
BOREHOLE DRILL LOGS

RESOURCE PROTECTION WELL REPORT Notice of Intent No. S27806

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *("x" in circle)*

⊗ Construction
○ Decommission *Original Construction Notice of Intent Number* _____

Type of Well *("x" in circle)*

○ Resource Protection
⊗ Geotech Soil Boring

Property Owner Bill Nilles (Carina Trust)

Unique Ecology Well ID Tag No. _____

Consulting Firm ~~Ecology & Environment, Inc.~~

Driller or Trainee Name _____

Driller or Trainee Signature _____

Driller or Trainee License No. _____

If trainee, licensed driller's Signature and License no. _____

Site Address 4275 State Highway 3 SW

City Port Orchard County: Kitsap

Location NW 1/4- 1/4 SW 1/4 Sec 1 Twn 23N R 1W EWM or WWM *circle one*

Lat/Long (s, t, r still REQUIRED) Lat Deg 47 Lat Min/Sec 30/45.69

Long Deg 122 Long Min/Sec 44/20.29

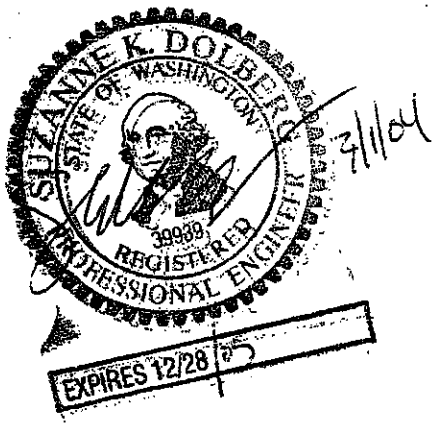
Tax Parcel No. 012301-4-022-1005

Cased or Uncased Diameter _____ Static Level _____

Work/Decommission Start Date 11/12/03

Work/Decommission Completed Date 11/12/03

Construction/Design	Well Data	Formation Description
PLEASE SEE ATTACHED DRILLING LOG OF WELL/BORING NO. BG04		



5/11/04

Scale 1"= _____

ECY 050-12 (Rev 2/01)

DRILLING LOG OF WELL/BORING NO. BG04

Client: Environmental Protection Agency (EPA)
Project: Gorst Creek- Bremerton Auto Wrecking Landfill
Boring Location:
START Card Number:
Location: Port Orchard, WA
Ground Elevation (feet above):
Date Drilled: 11-12-03
Total Depth of Hole (feet BGS): 4
Drilling Contractor: Ecology and Environment, Inc
Geologist: J. Fowlow
Drill Method: Geoprobe.
Log Editor: J. Spiegel

ELEVATION / DEPTH (feet)	GRAPHIC LOG	USCS CODE	SOIL/ROCK DESCRIPTION	SAMPLE ID	RECOVERY (feet)	PID (ppm)	FID (ppm)	COMMENTS
Ground Surface Elevation			*ground surface (gs)*					
0		ML	Sandy silt, moderate brown, dry, soft, slightly plastic, sand and gravel present. No manmade debris.	BG04SS		5	<1	
1								
2		SW	Sand, well graded, fine to coarse grained, moderate brown, dry, loose. With some gravel. No debris evident.	BG04SB04	3.5	10	<1	
3								
4								
5								
6								
7								
8								
9								
10								

WELL LEL PID FID RPWR.GPJ E&E PORTLAND.GDT 2/16/04

RESOURCE PROTECTION WELL REPORT Notice of Intent No. S27806

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *("x" in circle)*

(X) Construction
( ) Decommission *Original Construction Notice of Intent Number* _____

Type of Well *("x" in circle)*

( ) Resource Protection
(X) Geotech Soil Boring

Property Owner Bill Nilles (Carina Trust)

Unique Ecology Well ID Tag No. _____

Consulting Firm Ecology & Environment, Inc.

Driller or Trainee Name _____

Driller or Trainee Signature _____

Driller or Trainee License No _____

If trainee, licensed driller's Signature and License no. _____

Site Address 4275 State Highway 3 SW

City Port Orchard County: Kitsap

Location NW 1/4- 1/4 SW 1/4 Sec 1 Twn 23N R 1W EWM or WWM *circle one*

Lat/Long (s, t, r still REQUIRED) Lat Deg 47 Lat Min/Sec 30 36.28

Long Deg 122 Long Min/Sec 44 26.87

Tax Parcel No. 012301-4-022-1005

Cased or Uncased Diameter _____ Static Level _____

Work/Decommission Start Date 11/10/03

Work/Decommission Completed Date 11/10/03

Construction/Design	Well Data	Formation Description
PLEASE SEE ATTACHED DRILLING LOG OF WELL/BORING NO. LF01		

SUZANNE K. DOLEZAL
STATE OF WASHINGTON
39939
REGISTERED
PROFESSIONAL ENGINEER
3/1/04

EXPIRES 12/28/05

Scale 1"= _____ Page _____ of _____

ECY 050-12 (Rev 2/01)

DRILLING LOG OF WELL/BORING NO. LF01

Client: Environmental Protection Agency (EPA)
Project: Gorst Creek- Bremerton Auto Wrecking Landfill
Boring Location:
START Card Number:
Location: Port Orchard, WA
Ground Elevation (feet above):
Date Drilled: 11-10-03
Total Depth of Hole (feet BGS): 20
Drilling Contractor: Ecology and Environment, Inc
Geologist: J. Fowlow
Drill Method: Geoprobe.
Log Editor: J. Spiegel

ELEVATION / DEPTH (feet)	GRAPHIC LOG	USCS CODE	SOIL/ROCK DESCRIPTION	SAMPLE ID	RECOVERY (feet)	PID (ppm)	FID (ppm)	COMMENTS
Ground Surface Elevation			*ground surface (gs)*					
0		ML	Clayey silt, light brown, moist, slightly plastic, soft.	LF01SS		<1	<1	
1			Clayey silt, moderate brown, moist, slightly plastic, soft. With root fragments, concrete, and brick debris.					
2		ML		LF01SB04	2.5	<1	<1	
3								
4			Sandy silt with clay, dark brown, moist, slightly plastic, firm. With lenses of gravel and increasing sand.					
5								
6		ML		LF01SB08	2.5	<1	<1	
7								
8			Silty sand, fine grained sand, light grey, moist, loose. With significant wood debris and some gravel present.					
9		SM		LF01SB12	2.0	1	5	
10								

WELL LEL PID FID RPWR.GPJ E&E PORTLAND.GDT 2/16/04

PROJECT NAME: Gorst Creek- Bremerton Auto Wrecking Landfill
WELL NO.: LF01

ecology and environment, inc.

Client: Environmental Protection Agency (EPA) Project: Gorst Creek- Bremerton Auto Wrecking Landfill

ELEVATION / DEPTH (feet)	GRAPHIC LOG	USCS CODE	SOIL/ROCK DESCRIPTION	SAMPLE ID	RECOVERY (feet)	PID (ppm)	FID (ppm)	COMMENTS
11		SM	Silty sand, fine grained sand, light grey, moist, loose. With significant wood debris and some gravel present. *(continued)*	LF01SB12	2.0	1	5	
12			Wood debris, with some fragments of yellow fiberglass installation.					
13								
14					1.0			
15								
16			Fiberglass installation and wood fragments					
17								
18		ML			0.5			
19								
20								
21								
22								
23								

WELL LEL PID FID RPWR.GPJ E&E PORTLAND.GDT 2/16/04

RESOURCE PROTECTION WELL REPORT Notice of Intent No. S27806

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *("x" in circle)*

(X) Construction
( ) Decommission *Original Construction Notice of Intent Number* _____

Type of Well *("x" in circle)*

( ) Resource Protection
(X) Geotech Soil Boring

Property Owner Bill Nilles (Carina Trust)

Unique Ecology Well ID Tag No. _____

Consulting Firm Ecology & Environment, Inc.

Driller or Trainee Name _____

Driller or Trainee Signature _____

Driller or Trainee License No _____

If trainee, licensed driller's Signature and License no. _____

Site Address 4275 STate Highway 3 SW

City Port Orchard County: Kitsap

Location NW 1/4-1/4 SW 1/4 Sec 1 Twn 23N R 1W EWM or WWM *circle one*

Lat/Long (s, t, r still REQUIRED) Lat Deg 47 Lat Min/Sec 30 35.17

Long Deg 122 Long Min/Sec 44 26.27

Tax Parcel No. 012301-4-022-1005

Cased or Uncased Diameter _____ Static Level _____

Work/Decommission Start Date 11/10/03

Work/Decommission Completed Date 11/10/03

Construction/Design	Well Data	Formation Description
PLEASE SEE ATTACHED DRILLING LOG OF WELL/BORING NO. LF02		

SUZANNE K. DOLDER STATE OF WASHINGTON 39939 REGISTERED PROFESSIONAL ENGINEER 3/1/04 EXPIRES 12/28/05

Scale 1"=_____ Page_____of_____

ECY 050-12 (Rev 2/01)

DRILLING LOG OF WELL/BORING NO. LF02

Client: Environmental Protection Agency (EPA)
Project: Gorst Creek- Bremerton Auto Wrecking Landfill
Boring Location:
START Card Number:
Location: Port Orchard, WA
Ground Elevation (feet above):
Date Drilled: 11-10-03
Total Depth of Hole (feet BGS): 16
Drilling Contractor: Ecology and Environment, Inc
Geologist: J. Fowlow
Drill Method: Geoprobe.
Log Editor: J. Spiegel

ELEVATION / DEPTH (feet)	GRAPHIC LOG	USCS CODE	SOIL/ROCK DESCRIPTION	SAMPLE ID	RECOVERY (feet)	PID (ppm)	FID (ppm)	COMMENTS
Ground Surface Elevation			*ground surface (gs)*					
		ML	Clayey silt, light brown, moist, slightly plastic, soft. With root and wood debris	LF02SS		<1	<1	
1			Clayey silt with sand, light brown, moist, slightly plastic, soft. With roots and wood debris.					
2		ML		LF02SB04	2.0	<1	<1	
3								
4			Silty sand, sand fine grained, light brown to grey, dry, loose. With gravel, wood debris, glass fragments, and brick fragments found in bands.					
5								
6		SM		LF02SB08	2.0	<1	<1	
7								
8			Silty sand, sand fine grained, light brown, dry, loose. With gravel, wood debris and brick debris, and plastic.					
9		SM		LF02SB12	3.5	15	300	
10								

WELL LEL PID FID RPWR.GPJ E&E PORTLAND.GDT 2/16/04

PROJECT NAME: Gorst Creek- Bremerton Auto Wrecking Landfill
WELL NO.: LF02

ecology and environment, inc.

Client: Environmental Protection Agency (EPA) Project: Gorst Creek- Bremerton Auto Wrecking Landfill

ELEVATION	DEPTH (feet)	GRAPHIC LOG	USCS CODE	SOIL/ROCK DESCRIPTION	SAMPLE ID	RECOVERY (feet)	PID (ppm)	FID (ppm)	COMMENTS
	11		SM	Silty sand, sand fine grained, light brown, dry, loose. With gravel, wood debris and brick debris, and plastic. *(continued)*	LF02SB12	3.5	15	300	
	12			Silty sand, sand fine grained, light brown, dry, loose. With glass fragments, wood and brick debris, and plastics. Wood possibly stained.					
	13								
	14		SM		LF02SB16	3.0	5	45	
	15								
	16								
	17								
	18								
	19								
	20								
	21								
	22								
	23								

WELL LEL PID FID RPWR.GPJ E&E PORTLAND.GDT 2/16/04

RESOURCE PROTECTION WELL REPORT Notice of Intent No. S27806

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *("x" in circle)*

(X) Construction
( ) Decommission *Original Construction Notice of Intent Number* _____

Type of Well *("x" in circle)*

( ) Resource Protection
(X) Geotech Soil Boring

Property Owner ~~Bill Nilles (Carina Trust)~~

Unique Ecology Well ID Tag No. _____

Consulting Firm Ecology & Environment, Inc.

Driller or Trainee Name _____

Driller or Trainee Signature _____

Driller or Trainee License No. _____

If trainee, licensed driller's Signature and License no. _____

Site Address 4275 State Highway 3 SW

City Port Orchard County: Kitsap

Location NW 1/4- 1/4 SW 1/4 Sec 1 Twn 23 N R 1 W EWM or WWM *circle one*

Lat/Long (s, t, r still REQUIRED) Lat Deg 47 Lat Min/Sec 30/35.70

Long Deg 122 Long Min/Sec 444/25.6

Tax Parcel No. 012301-4-022-1005

Cased or Uncased Diameter _____ Static Level _____

Work/Decommission Start Date 11/11/03

Work/Decommission Completed Date 11/11/03

Construction/Design	Well Data	Formation Description
PLEASE SEE ATTACHED DRILLING LOGOF WELL/BORING		NO LF03

SUZANNE K. DOLPERT STATE OF WASHINGTON 39939 REGISTERED PROFESSIONAL ENGINEER

3/1/04

EXPIRES 12/28/05

Scale 1"=_____ Page_____of_____

ECY 050-12 (Rev 2/01)

DRILLING LOG OF WELL/BORING NO. LF03

Client: Environmental Protection Agency (EPA)
Project: Gorst Creek- Bremerton Auto Wrecking Landfill
Boring Location:
START Card Number:
Location: Port Orchard, WA
Ground Elevation (feet above):
Date Drilled: 11-11-03
Total Depth of Hole (feet BGS): 20
Drilling Contractor: Ecology and Environment, Inc
Geologist: J. Fowlow
Drill Method: Geoprobe.
Log Editor: J. Spiegel

ELEVATION / DEPTH (feet)	GRAPHIC LOG	USCS CODE	SOIL/ROCK DESCRIPTION	SAMPLE ID	RECOVERY (feet)	PID (ppm)	FID (ppm)	COMMENTS
Ground Surface Elevation			*ground surface (gs)*					
0		ML	Clayey silt with gravel, wood debris, light brown, moist, some plasticity.	LF03SS		0	0	
1			Sand, well graded, fine to coarse grained, light brown, dry, loose. With gravel and concrete debris.					
2		SW		LF03SB04	3.0	1	3	
3								
4			Sand, well graded, fine to coarse grained, light brown, dry, loose. With charred wood, brick and concrete debris, and gravel.					
5								
6		SW		LF03SB08	3.0	<1	<1	
7								
8			Sand, well graded, fine to coarse grained, light brown, dry, loose. With minor amounts of gravel and wood debris.					
9		SW		LF03SB12	3.5	<1	<1	
10								

WELL LEL PID FID RPWR.GPJ E&E PORTLAND.GDT 2/16/04

Client: Environmental Protection Agency (EPA) Project: Gorst Creek- Bremerton Auto Wrecking Landfill

ELEVATION / DEPTH (feet)	GRAPHIC LOG	USCS CODE	SOIL/ROCK DESCRIPTION	SAMPLE ID	RECOVERY (feet)	PID (ppm)	FID (ppm)	COMMENTS
11		SW	Sand, well graded, fine to coarse grained, light brown, dry, loose. With minor amounts of gravel and wood debris. *(continued)*	LF03SB12	3.5	<1	<1	
12			Sand, well graded, fine to coarse grained, light grey, dry, loose. With gravel, wood debris, and 3 inches thick black charred or stained wood.					
13								
14		SW		LF03SB16	3.0	50	900+	
15								
16			Sand, well graded, fine to coarse sand with fines, black, saturated, loose. With wood debris and some concrete. Oily liquid present.					
17								
18		SW		LF03SB20	2.0	100+	1500+	
19								
20								
21								
22								
23								

WELL LEL PID FID RPWR.GPJ E&E PORTLAND.GDT 2/16/04

RESOURCE PROTECTION WELL REPORT Notice of Intent No. S27806

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *("x" in circle)*

⊗ Construction

○ Decommission *Original Construction Notice of Intent Number* _____

Type of Well *("x" in circle)*

○ Resource Protection

⊗ Geotech Soil Boring

Property Owner Bill Nilles (Carina Trust)

Unique Ecology Well ID Tag No. _____

Consulting Firm Ecology & Environment, Inc.

Driller or Trainee Name _____

Driller or Trainee Signature _____

Driller or Trainee License No. _____

If trainee, licensed driller's Signature and License no. _____

Site Address 4275 State Highway 3 SW

City Port Orchard County: Kitsap

Location NW 1/4- 1/4 SW 1/4 Sec 1 Twn 23N R 1W EWM or WWM *circle one*

Lat/Long (s, t, r still REQUIRED) Lat Deg 47 Lat Min/Sec 30/36.26

Long Deg 122 Long Min/Sec 44/26.09

Tax Parcel No. 012301-4-022-1005

Cased or Uncased Diameter _____ Static Level _____

Work/Decommission Start Date 11/11/03

Work/Decommission Completed Date 11/11/03

Construction/Design	Well Data	Formation Description
PLEASE SEE ATTACHED DRILLING LOG OF WELL/BORING NO. LF04		

SUZANNE K. DOLBY STATE OF WASHINGTON 39939 REGISTERED PROFESSIONAL ENGINEER

3/1/04

EXPIRES 12/28/05

Scale 1"= _____ Page _____ of _____

ECY 050-12 (Rev 2/01)

DRILLING LOG OF WELL/BORING NO. LF04

Client: Environmental Protection Agency (EPA)
Project: Gorst Creek- Bremerton Auto Wrecking Landfill
Boring Location:
START Card Number:
Location: Port Orchard, WA
Ground Elevation (feet above):
Date Drilled: 11-11-03
Total Depth of Hole (feet BGS): 20
Drilling Contractor: Ecology and Environment, Inc
Geologist: J. Fowlow
Drill Method: Geoprobe.
Log Editor: J. Spiegel

ELEVATION / DEPTH (feet)	GRAPHIC LOG	USCS CODE	SOIL/ROCK DESCRIPTION	SAMPLE ID	RECOVERY (feet)	PID (ppm)	FID (ppm)	COMMENTS
Ground Surface Elevation			*ground surface (gs)*					
		SP	Sand, poorly graded, medium grained, moderate brown, dry, loose. With roots and vegetative matter. Sand, poorly graded, medium grained, moderate brown, dry, loose. With two 3" lenses of gravel.	LF04SS		<1	<1	
		SP		LF04SB04	2.5	30	1	
		SP-SM	Sand with silt, poorly graded, sand medium grained, moderate brown, dry, medium dense. With some gravel and brick debris.	LF04SB08	3.0	1000+	1	
		SW	Sand, well graded, fine to coarse grained, moderate brown, dry, loose. With gravel and charred wood.	LF04SB12	1.0	1	60	

1 2 3 4 5 6 7 8 9 10

WELL LEL PID FID RPWR.GPJ E&E PORTLAND.GDT 2/16/04

PROJECT NAME: Gorst Creek- Bremerton Auto Wrecking Landfill
WELL NO.: LF04

ecology and environment, inc.

Client: Environmental Protection Agency (EPA) Project: Gorst Creek- Bremerton Auto Wrecking Landfill

ELEVATION / DEPTH (feet)	GRAPHIC LOG	USCS CODE	SOIL/ROCK DESCRIPTION	SAMPLE ID	RECOVERY (feet)	PID (ppm)	FID (ppm)	COMMENTS
11		SW	Sand, well graded, fine to coarse grained, moderate brown, dry, loose. With gravel and charred wood. *(continued)*	LF04SB12	1.0	1	60	
12			Sand, well graded, fine to coarse grained, moderate brown, moist, loose. With plastic debris, wood debris, gravel, and charred wood. Small amount of black oily liquid.					
13								
14		SW		LF04SB16	2.0	5	120	
15								
16			Sand, well graded, fine to coarse grained, dark brown to black, moist, loose. With gravel and wood debris.					
17								
18		SW		LF04SB20	1.0	<1	<1	
19								
20								
21								
22								
23								

WELL LEL PID FID RPWR.GPJ E&E PORTLAND.GDT 2/16/04

RESOURCE PROTECTION WELL REPORT Notice of Intent No. S27806

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *("x" in circle)*

⊗ Construction
○ Decommission *Original Construction Notice of Intent Number* _____

Type of Well *("x" in circle)*

○ Resource Protection
⊗ Geotech Soil Boring

Property Owner Bill Nilles (Carina Trust)

Unique Ecology Well ID Tag No. _____

Consulting Firm Ecology & Environment, Inc.

Driller or Trainee Name _____

Driller or Trainee Signature _____

Driller or Trainee License No. _____

If trainee, licensed driller's Signature and License no. _____

Site Address 4275 State Highway 3 SW

City Port Orchard County: Kitsap

Location NW 1/4- 1/4 SW 1/4 Sec 1 Twn 23N R 1W EWM or WWM *circle one*

Lat/Long (s, t, r still REQUIRED) Lat Deg 47 Lat Min/Sec 30/34.64

Long Deg 122 Long Min/Sec 44/20.29

Tax Parcel No. 012301-4-022-1005

Cased or Uncased Diameter _____ Static Level _____

Work/Decommission Start Date 11/12/03

Work/Decommission Completed Date 11/12/03

Construction/Design	Well Data	Formation Description
PLEASE SEE ATTACHED DRILLING LOG FOR WELL/BORING NO. LF05		

SUZANNE K. DOLBERG
STATE OF WASHINGTON
99930
REGISTERED
PROFESSIONAL ENGINEER

1/04

EXPIRES 12/28/05

Scale 1"= _____ Page _____ of _____

ECY 050-12 (Rev 2/01)

Client: Environmental Protection Agency (EPA) Project: Gorst Creek- Bremerton Auto Wrecking Landfill

ELEVATION	DEPTH (feet)	GRAPHIC LOG	USCS CODE	SOIL/ROCK DESCRIPTION	SAMPLE ID	RECOVERY (feet)	PID (ppm)	FID (ppm)	COMMENTS
	11		SW	Sand, well graded, fine to coarse grained, moderate brown, dry, loose. With some gravel, insulation, wood, and plastic debris present. *(continued)*	LF05SB12	3.0	4	1	
	12			Sand, well graded, fine to very coarse grained, moderate brown, dry, loose. With two 2" layers including gravel. Native soil (?), no significant amount of debris, only at very top (slough?).					
	13								
	14		SW		LF05SB16	3.5	<1	<1	
	15								
	16			Sand, interbeds of poor and well grading. Well graded sand fine to very coarse grained with some gravel, poorly graded sand is medium grained. Sand moderate brown, dry to moist, loose. Native soil?					
	17								
	18		SW		LF05SB20	3.5	2	100	
	19								
	20								
	21								
	22								
	23								

WELL LEL PID FID RPWR.GPJ E&E PORTLAND.GDT 2/16/04

DRILLING LOG OF WELL/BORING NO. LF05

Client: Environmental Protection Agency (EPA)
Project: Gorst Creek- Bremerton Auto Wrecking Landfill
Boring Location:
START Card Number:
Location: Port Orchard, WA
Ground Elevation (feet above):
Date Drilled: 11-12-03
Total Depth of Hole (feet BGS): 20
Drilling Contractor: Ecology and Environment, Inc
Geologist: J. Fowlow
Drill Method: Geoprobe.
Log Editor: J. Spiegel

ELEVATION / DEPTH (feet)	GRAPHIC LOG	USCS CODE	SOIL/ROCK DESCRIPTION	SAMPLE ID	RECOVERY (feet)	PID (ppm)	FID (ppm)	COMMENTS
Ground Surface Elevation			*ground surface (gs)*					
		ML	Clayey silt with sand, moderate brown, moist, soft, slightly plastic. With wood debris.	LF05SS		<1	<1	
1			Sand, well graded, with gravel, sand fine to coarse grained, moderate brown, dry, loose. With insulation debris, plastic debris, wood and brick debris.					
2		SW		LF05SB04	3.0	<1	<1	
3								
4			Sand, well graded, fine to coarse grained, moderate brown, dry, loose. With some wood, brick and plastic debris.					
5								
6		SW		LF05SB08	2.5	2	5	
7								
8			Sand, well graded, fine to coarse grained, moderate brown, dry, loose. With some gravel, insulation, wood, and plastic debris present.					
9		SW		LF05SB12	3.0	4	1	
10								

WELL LEL PID FID RPWR.GPJ E&E PORTLAND.GDT 2/16/04

RESOURCE PROTECTION WELL REPORT Notice of Intent No. S27806

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *("x" in circle)*

- (X) Construction
- ( ) Decommission *Original Construction Notice of Intent Number* _____

Type of Well *("x" in circle)*

- ( ) Resource Protection
- (X) Geotech Soil Boring

Property Owner Bill Nilles (Carina Trust)

Unique Ecology Well ID Tag No. _____

Consulting Firm Ecology & Environment, Inc.

Driller or Trainee Name _____

Driller or Trainee Signature _____

Driller or Trainee License No _____

If trainee, licensed driller's Signature and License no. _____

Site Address 4275 State Highway 3 SW

City Port Orchard County: Kitsap

Location NW 1/4- 1/4 SW 1/4 Sec 1 Twn 23N R 1W EWM or WWM *circle one*

Lat/Long (s, t, r still REQUIRED) Lat Deg 47 Lat Min/Sec 30/35.57

Long Deg 122 Long Min/Sec 44/24.66

Tax Parcel No. 012301-4-022-1005

Cased or Uncased Diameter _____ Static Level _____

Work/Decommission Start Date 11/12/03

Work/Decommission Completed Date 11/12/03

Construction/Design	Well Data	Formation Description
PLEASE SEE ATTACHED DRILLING LOG FOR WELL/BORING NO. LF06		

SUZANNE K. DOLBERG STATE OF WASHINGTON 39939 REGISTERED PROFESSIONAL ENGINEER

3/11/04

EXPIRES 12/28/05

Scale 1"= _____ Page _____ of _____

ECY 050-12 (Rev 2/01)

DRILLING LOG OF WELL/BORING NO. LF06

Client: Environmental Protection Agency (EPA)
Project: Gorst Creek- Bremerton Auto Wrecking Landfill
Boring Location:
START Card Number:
Location: Port Orchard, WA
Ground Elevation (feet above):
Date Drilled: 11-12-03
Total Depth of Hole (feet BGS): 16
Drilling Contractor: Ecology and Environment, Inc
Geologist: J. Fowlow
Drill Method: Geoprobe.
Log Editor: J. Spiegel

ELEVATION / DEPTH (feet)	GRAPHIC LOG	USCS CODE	SOIL/ROCK DESCRIPTION	SAMPLE ID	RECOVERY (feet)	PID (ppm)	FID (ppm)	COMMENTS
Ground Surface Elevation			*ground surface (gs)*					
		ML	Clayey silt, moderate brown, moist, soft, slight plasticity. With roots and plastic debris.	LF06SS		<1	<1	
1		ML	Clayey silt, moderate brown, moist, soft, slight plasticity. With roots and plastic debris.	LF06SB04				
2		SW	Sand, well graded, fine to coarse grained, moderate brown, dry, loose. With wood, brick, concrete, plastic, and glass debris.		3.5	<1	<1	
3								
4		SW	Sand, well graded, fine to coarse grained, light brown, dry, loose, with some gravel layer. With wood and concrete debris. Layer of black, oily, stained wood debris @ 5'.					
5								
6		SW		LF06SB08	3.0	10	20	
7								
8		SW	Sand, well graded, fine to coarse grained, black to brown (black is stained oily liquid), loose. With wood debris, broken glass.					
9				LF06SB12	1.0	10	15	
10								

WELL LEL PID FID RPWR.GPJ E&E PORTLAND.GDT 2/16/04

PROJECT NAME: Gorst Creek- Bremerton Auto Wrecking Landfill
WELL NO.: LF06

ecology and environment, inc.

Client: Environmental Protection Agency (EPA) Project: Gorst Creek- Bremerton Auto Wrecking Landfill

ELEVATION	DEPTH (feet)	GRAPHIC LOG	USCS CODE	SOIL/ROCK DESCRIPTION	SAMPLE ID	RECOVERY (feet)	PID (ppm)	FID (ppm)	COMMENTS
	11		SW	Sand, well graded, fine to coarse grained, black to brown (black is stained oily liquid), loose. With wood debris, broken glass. *(continued)*	LF06SB12	1.0	10	15	
	12								
	13				LF06SB16				
	14					0.3			
	15								
	16			Wood debris.					
	17								
	18								
	19								
	20								
	21								
	22								
	23								

WELL LEL PID FID RPWR.GPJ E&E PORTLAND.GDT 2/16/04

APPENDIX D

GLOBAL POSITIONING SYSTEM DATA

Table O-1

GLOBAL POSITIONING SYSTEM DATA
GORST CREEK - BREMERTON AUTO WRECKING LANDFILL INTEGRATED ASSESSMENT
PORT ORCHARD, WASHINGTON

EPA Regional Tracking Number	Field Number	Decimal Degrees		Longitude			Latitude			PDOP	Horizontal Accuracy (meters)
		Longitude	Latitude	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds		
03464400	LF01SS	-122.740799505	47.510078274	-122	44	26.878218	47	30	36.2817864	2.9	0.6
03464401	LF01SB04	-122.740799505	47.510078274	-122	44	26.878218	47	30	36.2817864	2.9	0.6
03464402	LF01SB08	-122.740799505	47.510078274	-122	44	26.878218	47	30	36.2817864	2.9	0.6
03464403	LF01SB12	-122.740799505	47.510078274	-122	44	26.878218	47	30	36.2817864	2.9	0.6
03464404	LF02SS	-122.740631245	47.509771189	-122	44	26.272482	47	30	35.1762804	2.9	0.6
03464405	LF02SB04	-122.740631245	47.509771189	-122	44	26.272482	47	30	35.1762804	2.9	0.6
03464406	LF02SB08	-122.740631245	47.509771189	-122	44	26.272482	47	30	35.1762804	2.9	0.6
03464407	LF02SB12	-122.740631245	47.509771189	-122	44	26.272482	47	30	35.1762804	2.9	0.6
03464408	LF02SB16	-122.740631245	47.509771189	-122	44	26.272482	47	30	35.1762804	2.9	0.6
03464409	LF03SS	-122.740458954	47.509918711	-122	44	25.6522344	47	30	35.7073596	2.8	0.6
03464410	LF03SB04	-122.740458954	47.509918711	-122	44	25.6522344	47	30	35.7073596	2.8	0.6
03464411	LF03SB08	-122.740458954	47.509918711	-122	44	25.6522344	47	30	35.7073596	2.8	0.6
03464412	LF03SB12	-122.740458954	47.509918711	-122	44	25.6522344	47	30	35.7073596	2.8	0.6
03464413	LF03SB16	-122.740458954	47.509918711	-122	44	25.6522344	47	30	35.7073596	2.8	0.6
03464414	LF03SB20	-122.740458954	47.509918711	-122	44	25.6522344	47	30	35.7073596	2.8	0.6
03464415	LF04SS	-122.740581388	47.510073915	-122	44	26.0929968	47	30	36.266094	2.8	0.6
03464416	LF04SB04	-122.740581388	47.510073915	-122	44	26.0929968	47	30	36.266094	2.8	0.6
03464417	LF04SB08	-122.740581388	47.510073915	-122	44	26.0929968	47	30	36.266094	2.8	0.6
03464418	LF04SB12	-122.740581388	47.510073915	-122	44	26.0929968	47	30	36.266094	2.8	0.6
03464419	LF04SB16	-122.740581388	47.510073915	-122	44	26.0929968	47	30	36.266094	2.8	0.6
03464420	LF04SB20	-122.740581388	47.510073915	-122	44	26.0929968	47	30	36.266094	2.8	0.6
03464422	MW01GW	-122.741364506	47.512439908	-122	44	28.9122216	47	30	44.7836688	6	1.2
03464423	BG01GW	-122.742180756	47.522047270	-122	44	31.8507216	47	31	19.370172	5.5	0.8
03464424	GC03SW	-122.739064391	47.509088238	-122	44	20.6318076	47	30	32.7176568	5.9	1
03464425	GC03SD	-122.739064391	47.509088238	-122	44	20.6318076	47	30	32.7176568	5.9	1
03464426	GC02SD	-122.737859529	47.507863858	-122	44	16.2943044	47	30	28.3098888	5.6	0.8
03464427	BG02SW	-122.735108551	47.505534311	-122	44	6.3907836	47	30	19.9235196	5.8	0.9
03464429	GC05SD	-122.742480450	47.510718368	-122	44	32.92962	47	30	38.5861248	3.8	0.6
03464430	GC04SW	-122.741692818	47.510459062	-122	44	30.0941448	47	30	37.6526232	4.7	0.7
03464431	GC04SD	-122.741692818	47.510459062	-122	44	30.0941448	47	30	37.6526232	4.7	0.7
03464432	LF05SS	-122.740383103	47.509622911	-122	44	25.3791708	47	30	34.6424796	2.4	0.3
03464433	LF05SB04	-122.740383103	47.509622911	-122	44	25.3791708	47	30	34.6424796	2.4	0.3
03464434	LF05SB08	-122.740383103	47.509622911	-122	44	25.3791708	47	30	34.6424796	2.4	0.3

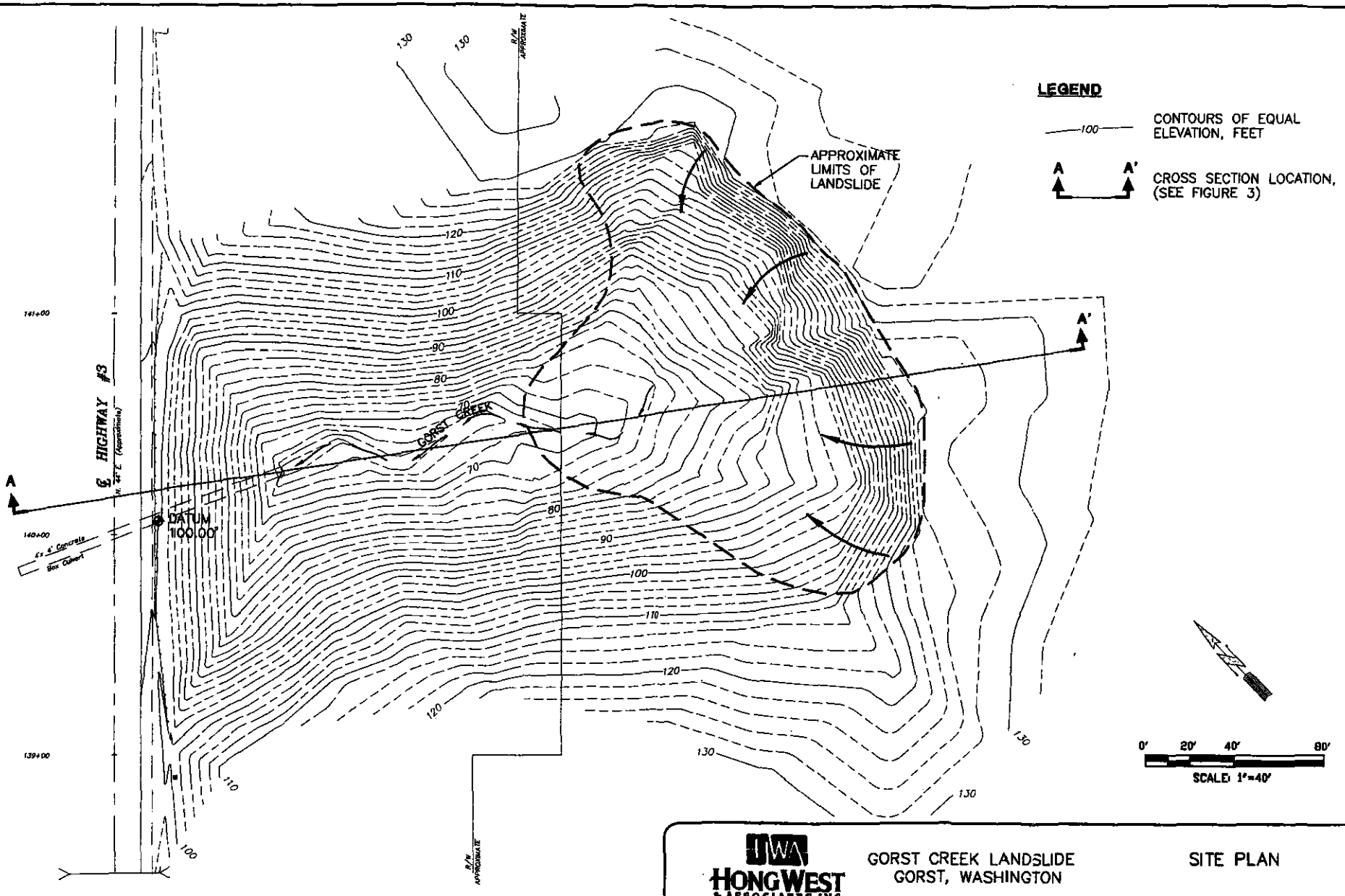
Table C-1

GLOBAL POSITIONING SYSTEM DATA
GORST CREEK - BREMERTON AUTO WRECKING LANDFILL INTEGRATED ASSESSMENT
PORT ORCHARD, WASHINGTON

EPA Regional Tracking Number	Field Number	Decimal Degrees		Longitude			Latitude			PDOP	Horizontal Accuracy (meters)
		Longitude	Latitude	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds		
03464435	LF05SB12	-122.740383103	47.509622911	-122	44	25.3791708	47	30	34.6424796	2.4	0.3
03464436	LF05SB16	-122.740383103	47.509622911	-122	44	25.3791708	47	30	34.6424796	2.4	0.3
03464437	LF05SB20	-122.740383103	47.509622911	-122	44	25.3791708	47	30	34.6424796	2.4	0.3
03464438	LF06SS	-122.740183582	47.509882905	-122	44	24.6608952	47	30	35.578458	3	0.5
03464439	LF06SB04	-122.740183582	47.509882905	-122	44	24.6608952	47	30	35.578458	3	0.5
03464440	LF06SB08	-122.740183582	47.509882905	-122	44	24.6608952	47	30	35.578458	3	0.5
03464441	LF06SB12	-122.740183582	47.509882905	-122	44	24.6608952	47	30	35.578458	3	0.5
03464442	LF06SB16	-122.740183582	47.509882905	-122	44	24.6608952	47	30	35.578458	3	0.5
03464443	BG04SS	-122.738972000	47.512694000	-122	44	20.2992000	47	30	45.6984000	5.6	0.9
03464444	BG04SB04	-122.738972000	47.512694000	-122	44	20.2992000	47	30	45.6984000	5.6	0.9
03464445	LF06GW	-122.740183582	47.509882905	-122	44	24.6608952	47	30	35.578458	3	0.5
03464447	GC06SD	-122.708509550	47.529392697	-122	42	30.63438	47	31	45.8137092	3.6	0.4

APPENDIX E

DATA VALIDATION MEMORANDA AND ANALYTICAL RESULTS



REFERENCE: Mapping provided by AES CONSULTANTS, Silverdale, Washington.

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HONGWEST & ASSOCIATES, INC.

GORST CREEK LANDSLIDE
GORST, WASHINGTON

SITE PLAN

PROJECT NO.: 97063 FIGURE: 2